THE PROPERTY VALUES OF URBAN SINGLE-FAMILY HOUSING: A CASE STUDY OF BLOEMFONTEIN

by

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CONTENTS

Part 1

CHAPTER 5 STUDY AREA AND SAMPLING PROCEDURE

CHAPTER 9 VALUATION PERFORMANCE AND SYNTHESIS

TABLES

DIAGRAMS

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CHAPTER 1

PURPOSE AND THEORETICAL REFERENCE

1.1 Purpose

The purpose of the study is;

1.1.1 to determine, in respect of properties zoned for usage by single-family housing in Bloemfontein and Langenhoven Park, the degree of regressivity of the municipal property tax and whether horizontal and vertical valuation inequity exists; and

1.1.2 to construct a prognostic model of the value of fixed property zoned for usage by single-family housing in a racially segregated, free enterprise and westernised urban society. The theoretical underpinning of the model is based on the ecological paradigm and the subsequent differentiation of the single-family housing units situated in the White section of the housing market in Bloemfontein and Langenhoven Park into hierarchical subgroups of integrated economic and socio-geographic status.

1.2 Theoretical reference

1.2.1 Geography and public policy

With man's greater awareness of and concern with the injustices prevalent in modern society, from advanced free capitalist societies through to socialist and centrally controlled societies, and his concerned effort to effect an adjustment in these inequities and injustices, various geographers, being nudged by their sense of moral obligation as well as by changing social necessities, have turned to researching various aspects of social injustice and inequity. These studies are being undertaken to contribute to the determination of the underlying causes of social injustice, to ascertain whether social injustice is a function of geographical location, to determine and map the spatial distribution of social injustice and to suggest ways and means to right, viewed through the geographical focus, these social injustices and inequities.

The major entity contributing to the introduction and maintenance of social injustice and inequity is the ruling political society. Through its elected (or appointed) representatives and appointed bureaucrats the ruling political society endeavours to maintain the status quo - the more autocratic the society, the greater the tendency to exhibit an aversion to change. Conversely the ruling political society can also be the major initiator of adjustment in the status quo to overcome and remove the social injustices in a particular society. However, such changes can only be initiated if the political system has been made aware of these injustices and has been presented with methods by which the status quo can be adapted to accommodate adjustments that will eradicate social injustices without overthrowing the existing political system or society. For this to come about the ruling political society must be receptive to the idea of change and the betterment of society as a whole.

One of the major sources of social injustice is the public policy enacted by central, regional and local governments in respect of public finances - raising of revenue, expenditure of public funds to finance the provision of public goods and services, and fiscal incidence (the balance between revenue and expenditure). Accordingly "the central concern of most studies in public finance has been the relative burden of revenue sources (especially taxes) between different groups of people (usually income groups), and the relative differences of expenditure between groups of people either in terms of direct receipts, or in terms of benefits received. This relation of burden and expenditure is frequently termed fiscal incidence, or 'who gets what' benefits from public finance" (Bennet, p. 1).

The ultimate purpose of most of these studies in public finance is to achieve the eradication of fiscal inequities and injustices. Equity in public finance will firstly result in the distribution of funds to maintain services of equal quality for those in equal need, taking account of variations in service costs, and secondly in the distribution of revenue burdens in proportion to ability to pay, with equal tax burdens placed on those with equal ability to pay.

"The aim of fiscal equity, ..., should be equal treatment of equals, and equally unequal treatment of unequals under the public fisc" (Bennet, p. 176).

There are various reasons for the growing concern with inequity and injustice in public finance. The reasons are: 1) the increasing fiscal problems of urban areas, 2) the fiscal imbalance within urban areas - especially between poor central city areas and rich suburban areas, 3) the conflict between national and local interests as a result of the fragmentation of governmental powers owing to a policy of devolution of power being pursued or owing to the demands and efforts of separatist movements and 4) the desire of supra-national organisations such as the EEC, World Bank and IMF to create better fiscal harmony in international relations (Bennet, p. 2).

Urban areas have been the major focus in public policy research, especially in respect of public finances and with the purpose of achieving a redress in financial inequities. This is to be expected, as nowhere is social injustice and inequity as visual, easily observable and rich and poor as closely situated together as in the city. Furthermore, the continuing decrease in the income of local authorities - especially central city governments - coupled with increasing demands for the provision of more and better services, has also heightened the public's awareness of social and fiscal injustices in urban areas. Whereas to the ordinary citizen central and regional government institutions seem far removed, not easily approachable and relatively unchangeable, local government maintains a relatively high profile and any decisions by local government affect the "man in the street" more directly and immediately. He further feels that the local government system is easily approachable and more easily changeable and therefore he voices his displeasure or approval of the local political system more easily and forcefully.

The issues and problems facing urban governments in respect of the raising of public revenue, expenditure of such revenue and fiscal incidence that have to be resolved, are primarily of an economic and political nature. Geographers, however, can make an important contribution to the resolution of the problems of public finances of urban governments, since "the problem is not only an economic **or political**[1] one, it is also to an increasing extent a geographical one, since local government activity is very closely tied to the kinds of spatial frameworks within which funds are raised and decisions made" (Yeates et al., p. 421).

The spatial manifestation of social and fiscal injustices and inequities resulting from the implementation of an unjust public policy calls for research on public policy issues from a geographical point of view. Variations in revenue, expenditure and policy "occur in a spatial context, and many of the policy-environment relationships involve factors which are spatially variable and factors which relate to the geographical aspects of local government areas" (Barlow, p. 39).

Geographical studies of central, regional and local government finances, are concerned with the following: 1) the spatial patterns of revenue raising, the spatial patterns of revenue

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[1] words added

revenue and expenditure (Bennet, p. 1), 2) determining whether fiscal injustices and inequities are a function of geographical location, 3) ascertaining whether the spatial patterns of revenue, expenditure and fiscal incidence conform to the expected norms of fiscal justice and equity, 4) the identification and analysis of the causal spatial factors resulting in fiscal injustices and inequities, and 5) ultimately presenting governmental institutions with the necessary machinery and techniques for the just implementation of the provisions of any law and regulation to eradicate the incidence of fiscal injustice and inequity, particularly if these injustices or inequities should exhibit spatial patterns or be the result of spatial factors.

1.2.2 Geography and property tax

"The property tax, ..., is intrinsically a geographic topic because of its close association with land, the importance of location as a component in the value of real property, and the spatial variability of property tax rates and values" (Browning, p. 36).

Evidence of variability in the property tax base and the valuation of land and improvements, has been well documented by various researchers. Variability in the property tax and property values has been found on an intra-urban and interurban (intrametropolitan) scale. The empirical findings of studies in respect of the variability of property taxes and property values are set out in table 1.1.

One of the major common conclusions that can be drawn from the empirical findings of these studies is that a variability in the property tax liability of single-family residential units is not an uncommon occurrence in urban areas. A further conclusion is that the average level of taxes on properties varies with location and that this variability is not erratic but related to certain socio-economic, life-cycle and ethnic-status characteristics of the population as well as being related to housing characteristics, structure types and relative location of housing units to certain externalities.

Variations in urban property tax liability also create spatial patterns that are significant to city structure. These variations can influence the location of households as well as firms, and the intra-urban and interurban variations in property tax not only form a significant element of the structure of a city, but can also influence the arrangement of other elements (Barlow, p. 10).

Geographical studies of the property tax levied on single-family residential units raise and attempt to answer the crucial question of who pay what proportion of the property tax revenue of a local government as a function of their location in socio-economic, life-cycle, ethnic and physical space. These geographical studies should, however, not be limited to only identifying the spatial pattern and spatial characteristics of property tax variability, to identifying the spatial pattern of the subsequent fiscal injustices and to investigating and identifying the underlying reasons for property tax inequities,

Table 1.1 VALUATION INEQUITIES: HOUSING: SAMPLE OF RECENT STUDIES

Author and date	City or area	Under-valuation correlated with:	Over-valuation correlated with:
Berry, B.J.L. and Bednarz R.S. 1975	Chicago	High-income areas. Areas in which the residences of politically strong members of society are situated.	Areas of racial transition. Black residential areas. Areas of relatively declining property values.
Black, D.E. 1972	Boston	High median-income areas. Areas with high relative property values, properties showing little physical deterioration and inhabited almost exclusively by Whites.	Areas with large Black population. Areas with increases in density of low-quality housing.
Carbone, R. and Lai, R.S. 1974	Pittsburgh	High-valued properties situated in affluent neighbourhoods.	Low-valued properties situated in poor neighbourhoods with high crime rates.
Downing, R.H. and Gamble, H.B. 1975	Luzerne County, Centre County, Lycoming County and Montgomery County		High-valued properties (progressive valuation bias).
Engle, R.F. 1975	Boston		Neighbourhoods with relatively slow rates of increase in property values. Blighted areas. Low-income areas. Central city areas (1946).
Oldman, O. and Aaron, H. 1965	Boston	Dormitory areas. Areas of high-valued properties (single-family housing units). Areas with relatively faster increasing property values.	Areas of low-valued properties. Areas of high-valued properties (multi-family units). Central city areas. Areas with high population densities. Properties affected by negative externalities.
Plattner, R.H. 1978	All states of U.S.A.	High-valued properties. Properties increasing relatively faster in value than others.	
Schroeder, L.D., Sheftall, W. and Sjoquist, D.L. 1975	Atlantic City and Fulton County		Areas of low-valued housing.

Table 1.1 Continued...

Author and date	City or area	Under-valuation correlated with:	Over-valuation correlated with:
Schroeder, L.D., and Sjoquist, D.L. 1976	Atlantic City	Areas that have above-average price increases. High- and low-valued properties. Older homes.	Areas with large percentage of population non-Whites. Low-valued housing situated in high-value areas and vice versa.
Smith, T.R. 1972	Hartford	High socio-economic status areas. Properties with high market values.	Areas with a high percentage of the population non-Whites. Areas characterised by civil unrest.
Thrall, G.I. 1979(b)	Hamilton	Areas experiencing an increase in land use intensity.	Areas with high population densities, recent immigrants, small dwelling size and relatively low-income households. Housing with negative externalities from tangential industry (in some cases).

but should also, from their unique geographical perspective, make meaningful attempts to formulate and develop appropriate methods to rectify and redress these fiscal injustices and inequities.

By making such a tangible and appropriate contribution, geographers can demonstrate to the academic community, government and public that they have the necessary analytical skills and concepts to contribute effectively and uniquely to the solution of one of the major problems facing society. If not, geography will once again have to face the loss to others of more enterprising disposition, of a research role that is singularly geographic in nature.

1.2.3 Geography and property values

The resolution of property tax inequities and injustices can only be effected if inequities in the valuation of land and improvements, the basis of the property tax, are eliminated. This can be done by improving the present property valuation techniques. Since location is such an important component of property values, the geographer can make a major contribution to the development of better property valuation techniques.

"Perhaps the most challenging and intriguing topic of geographic research is not the property tax itself, but the nature of the underlying property values which the property tax purports to tax" (Browning, p. 38).

1.3 Models of the urban housing market

1.3.1 Classification of models of the urban housing market

The formulation of a relevant and significant operational prognostic model of urban residential values, in which the influence of spatial location is given an appropriate role, requires that the model should have a strong theoretical and methodological underpinning.

Owing to the complex nature of housing, the complexity of interrelationships generated by housing and the variety of social and economic theories upon which housing studies have been based, no uniform approach to the study of urban housing markets and residential location, as well as accompanying theories and methodologies, has been developed. Instead various divergent approaches can be identified.

Robson differentiates between Marxist and non-Marxist studies while under the latter he discerns the following further approaches: micro-economic, social ecology, conflict theory and managerialism. Basset and Short identify the ecological, neoclassical economic, institutional (they include managerialism, locational and conflict approaches under this category) and Marxist approaches. In addition to those approaches identified by Basset and Short, Kirby distinguishes a further approach - the behavioural approach to consumer decision-making and residential mobility. The behavioural approach is recognised by various authors, but they see this approach as being extra to the scheme, developing out of the ecological and neo-classical approaches (Kirby, D.A., p. 10).

D.A. Kirby broadly classifies the neo-classical economic (under which he includes spatial interaction models), ecological and behavioural approaches as demand-based explanations of the housing market, as these studies focus on the competition between households for land, a location within the city and a dwellling. The institutional and Marxist approaches are seen as supply-based, focussing on those factors affecting the supply of housing (pp. 9 - 24).

Herbert and Thomas maintain a viewpoint nearly similar to that of D.A. Kirby with regard to the broader classification of urban housing market and residential location studies. They differentiate between the following approaches:

1) attempts to model the urban housing market on the principles of neo-classical economics using a small number of basic variables;

2) analyses of the residential mobility process per sé with a focus upon the consumers in the housing market who, within recognised constraints, are making decisions on where to live - thus the demand process;

3) studies of the factors and agencies involved in the supply of housing and urban development in general. These studies are concerned with the decision-makers on the supply side of urban housing markets and with the allocative systems which are involved (Herbert et al., p. 317).

Although initially divergent approaches were employed to study the housing market and process of residential mobility, it was only recently that these approaches were recognised as parts of the same overall theoretical framework (Herbert et al., p. 317). Although their points of departure and path of explanation differed, their ultimate destination was the same. These approaches are thus complementary and not contradictory and they emphasise different aspects of the process through which families and individuals are distributed through urban residential space.

The formulation of a satisfactory theoretical and methodological framework as basis to a model of urban house prices is now possible by drawing on each of the approaches employed in the past and utilising the best of each. As D.A. Kirby states: "In particular, attention need to be focussed on the relationship between household choice and the constraints imposed by the agencies of supply, thus unifying the managerial and behavioral approaches" (p. 35).

Prior to formulating an integrated behavioural model of the owner-occupied sector (to which attention is here confined) of the urban housing market based on the behaviour and decision-making processes of the consumers and suppliers of housing, a brief overview of the major postulates of, extensions to and criticisms against theoretical economically ordered models of the urban housing market will be given. This is done because of the important contribution that these models have made towards explaining how the urban housing market operates, the valuable perceptions of the process of establishment and evolution of the differentiated residential structure of urban areas presented by these models and the insights into the intricacies of supply and demand in the housing market given by the models.

1.3.2 Micro-economic models

The micro-economic models of urban land use developed during the sixties (Alonso (1961), Wingo (1961), Mills (1967) and Muth (1961, 1968, 1969)) are loosely based on the Von Thünen trade-off model of agricultural land use. The basics of the approach is that firms and households compete, within the constraints of their budgets, for space and optimal locations within the city. Thus consumers attempt to maximise a utility function subject to a budget constraint while producers attempt to maximise profits. Locational equilibrium is achieved by trading off the cost of housing (locational rent or price) against the costs of other goods and both against accessibility to the city centre (cost of commuting). The models are set in the economics of supply and demand and merge neo-classical economic concepts of consumer behaviour into a framework of a long-run general equilibrium.

To simplify the analysis of the urban property market, the models are subjected to various restrictive assumptions. The assumptions are that man acts as a rational economic being, that perfect competition exists between households and firms, that household tastes are invariant and that information on market prices is widely available. The urban area is monocentric, situated on an isotropic surface on which transport is equally easy in all directions while transport costs, as a function of distance, are positive and known. Housing is a unidimensional product that adapts immediately to new needs while there are no legal restrictions on the usage of land. In some models the influence of housing is completely ignored. The central business district (CBD) is the most accessible location in the urban system and the only centre of employment. The CBD is the most sought-after location, resulting in prices which are higher in the centre than the periphery of the urban area.

The assumptions of the model allow for relatively simplistic generalisations regarding the forms of the price-distance function and population density function to be derived analytically. The output from the model is a market equilibrium of locational rents (prices) and a long-term equilibrium pattern of residential locations of households based on the maximisation of the households' utility functions and preferences in respect of housing consumed, access to employment at the city centre and consumption of other non-housing goods. The various land uses display typical bid-rent curves that degenerate with an increasing distance from the CBD. The slope of the bid-rent curves differs for the various land uses because the utility of less central sites declines at different rates for each land use. Commercial land uses are willing to pay the higher locational rents that central locations demand because of the greater accessiblity and higher income associated with such locations. Residential land use will be found in the peripheral locations where people will trade off commuting costs, housing costs and costs of other non-housing goods when, operating within the constraints of their budgets, they decide on which location to occupy. Residential locations at greater distances from the CBD necessitate higher travel costs and a lower unit price for housing is therefore required to compensate for the extra travel expenditure. If the demand for housing, however, is price-elastic, the lower prices at greater distances from the CBD will result in an increased quantity of housing being consumed there. Households of various types, differing in respect of income and other preferences and in their valuation of time, will arrange themselves in increasing distance from the CBD on the basis of the steepness of the slope of their effective bid-rent curves. The steepness of this curve will depend on the valuation of time and on the elasticity of demand for housing. (Ball et al., p. 13). Poorer households will occupy the more central locations since they can achieve their lowest total outlay by reducing travel costs and purchasing (renting) small units of high-cost central locations, thus living at higher densities. The rich will live at greater distances from the CBD, will spend large amounts on commuting but will live at low densities on cheap land. The quantity of housing consumed by households, the household's expenditure on housing and its location are thus dependent on the parameters of firstly, the **demand function** (income and price elasticities of demand), secondly the **transport cost and speed function** and the valuation of time and thirdly the **market price-distance** (or price distribution) **function**. (Ball et al., p. 13). Firms and households thus arrange themselves in concentric circles around the CBD according to their income, accessibility needs and space preferences.

The spatial relationships of the model are: 1) a negative relationship between population density and distance from the urban centre (the relationship is convex); 2) a positive relationship between lot size and distance from the CBD; 3) a positive relationship between household income and distance from the CBD; and 4) a positive relationship between lot size and household income.

The micro-economic models have been severely criticised, with much of the criticism being directed at the limiting assumptions of the models. The non-existence of economic man and perfect competition is no longer doubted (Kirby, D.A., p. 12). Commuting costs also play a very small role in the location decision, provided that the housing is located within commuting limits. The reason is that households attempt to maximise their area preferences within the limitations set by their ability to obtain a mortgage and are willing to pay both housing and travelling costs with no attempts at trade off (Kirby, A.M., p.4). Counter to the negative price(locational rent)-distance relationship stressed by the models, A.M. Kirby states that if the price is measured in terms of total price, a positive price-distance relationship emerges. The total price of housing located in peripheral areas is thus higher than that of more centrally located housing. If, however, the price is measured in an area unit, the price of peripheral housing would be cheaper, because when locating on the urban periphery, households have to purchase surplus land to obtain housing (p. 4).

Maclennan objects to the overaggregative nature of the micro-economic models with the implied assumption of one pricing structure in the housing market whereas a disaggregated submarket price structure is most probably the rule (p. 63). The influence of time is also not considered in the models. It is, however, imperative that in rapid inflationary economic situations explicit temporal dimensions should be considered in any models of the housing market (Maclennan, p. 70).

Harvey directs his criticism at the fundamental logic underlying the models as well as the purposes for which they have been developed. The logical structure of neo-classical economic theory is criticised on the ground that it reduces households' behaviour to a set of unidimensional laws which mirror the preferences of the dominant social class. The purpose of the models is to perpetuate the status quo by developing theories which rationalise the inherent inequalities in society in the consumption of land and housing (Bourne, 1981, p. 133).

The existing housing stock was not taken into consideration in the initial formulation of the models (Alonso, 1961) while later models (Muth, 1969) which incorporated a heterogeneous, historically durable and complex housing stock only met with partial success in housing market studies (Bourne, 1981, p. 132).

Various authors (Wheaton, 1977; Downs, 1975) have suggested that the elasticities for land and commuting are roughly the same. The reason why the rich live on the periphery is not to be found in the trade-off mechanism, but in factors such as neighbourhood externalities, fiscal incentives, political fragmentation, the relative cost of new housing, ease of financing, the lower cost of developing vacant land, differing life-style needs and the social status of suburban living (Bourne, 1981, p. 133).

The assumption that people know what they are buying has also been attacked. Most people lack information and are not aware of what they are getting when moving into a dwelling unit and neighbourhood (Bourne, 1981, p. 133).

The most serious criticism directed at neo-classical models is their failure to consider the supply and allocation of housing. The models assume that supply is generated in response to demand (Kirby, D.A., p. 12).

Consequent upon these criticisms the models have been extensively modified and refined by relaxing the restrictive assumptions. The possibility of a multi-centered urban area has been considered by De Leeuw (1972), varying tastes and utility functions have been incorporated (Beckman, 1974), while the cost of moving (Muth, 1969), influence of racial discrimination (Kain and Quigly, 1975), heterogeneity in the housing stock (Strazheim, 1975) and measures of environmental amenities (Berry and Bednarz, 1975) have all been included. Pines (1975) has modified the model to allow the rich - those of them to whom space is important - to live on the periphery, and those who place a greater premium on time, to live in the central city. (Bourne, 1981, p. 133; Kirby, D.A., p. 12).

Notwithstanding these modifications the applicability of micro-economic models in real-world situations is still widely questioned. Although the models with their various extensions and modifications have presented us with valuable insight into the residential structure of urban areas and have illuminated the complexities of supply and demand, the major departures from real-world conditions inherent in the models have resulted in the models not being able to explain reality satisfactorily. There are various aspects of reality that they cannot measure or which can be analysed in a different and much more satisfactory way (Herbert *et al.*, p. 318; Kirby, D.A., p. 12; Senior, 1974, p. 377).

The models have not been able to formulate "operational tools, that simulate demand, supply and market-clearing processes, ..." (Senior, 1974, p. 377) and according to Robson (1975): "While the economic approach has thrown much light on the complexities of supply and demand, there is ... scope for a more sociological approach" (p. 14).

The neo-classical economic approach has stimulated research in the development of spatial interaction models. Spatial interaction models (also called urban development models) are large-scale modelling strategies incorporating various housing sub-models. The models attempt to conceptualise the overall process of urban growth and operation of the housing market. The purpose of the models is to duplicate existing housing occupancy patterns and to operate as forecasting devices for testing policy alternatives.

The models are primarily spatial allocation models and involve the application of the principles of Newtonian physics to allocate housing to specific locations (Kirby, D.A., p. 12). Early models were of the static equilibrium type and were aggregated over population, housing and population types (Senior, 1976, p. 285).

The allocation problem to be resolved was: Given H_{kv} housing units of type k and value v, and U_{ir} households of income level i and with an ordering r of housing preferences, to which housing units spread over j regions in the city are households allocated? (Bourne, 1976, p. 128). In subsequent model developments, the variables were disaggregated, but still within a static equilibrium framework, and attempts were made to specify residential attraction more fully to supplement the usual accessibility measure (Senior, 1977, p. 284). The models are based on strong assumptions regarding growth rates, forecasts of public actions subject to simple locational parameters and constraints on allowable densities in each region (Bourne, 1977, p. 128).

Most of the earlier models were essentially accounting systems for residential change with only strictly mechanical changes permitted. Later versions of the models depended to a greater extent on probabilistic simulation.

Although these models have added considerable technical ability to urban analyses, they have been widely criticised. Wilson is of the opinion that one of the advantages of spatial interaction models is that they are easily extendable and that they make up for one of the major shortcomings of the micro-economic models - the inability to formulate effective operational models. D.A. Kirby, however, questions Wilson's confidence in spatial interaction models and mentions that Openshaw had, after the empirical study of nine such models, raised severe doubts about the empirical acceptability of current spatial interaction models, especially due to their excessive data requirements

(p. 14). The models have also been criticised for their inability or failure to take into consideration the diverse nature of housing submarkets (the housing market is seen as a unitary market in these models) and the varying adaptability of the inherited historical housing stock in the city (Herbert et al., p. 319). Other critics have noted the models' failure to model the market and policy mechanisms involved in housing supply and to allow for a realistic determination of housing prices; the fact that the models are colour blind and do not allow for competition between residential and non-residential land uses; and the fact that the models are largely oblivious to the important role of public and financial institutions in the housing market (Bourne, 1976, pp. 128 and 129). The main criticism against the models is their simplistic view of the urban housing market (Kirby, D.A., p. 14).

1.3.3 An integrated behavioural model of the urban housing market

Since the overaggregative models of the urban housing market based on the principles of neo-classical economics are unable to explain adequately the residential structure of urban areas and the consequential systematic spatial variation of house prices over the urban housing surface flowing from the operation of a dynamic housing market under real-world conditions, an alternative view to the operation of the urban housing market is required.

A more fruitful approach to explaining the spatial results of the operation of the urban housing market is to be found in the behavioural and decision-making processes of the consumers of housing, as constrained and controlled by the decisions and actions of the agencies of supply and allocation of housing resources.

The complex interaction and reciprocating influences, on the individual and aggregate level, of the decisions and behaviour of the consumers of housing and the agents of supply and allocation of housing on the decisions and behaviour of each other, make it extremely difficult to construct an integrated, comprehensive operational model of the urban housing market. This problem has been encountered by various researchers and although it is preferable and more realistic to treat the demand and supply components of the urban housing market at the same time, it has as yet not been satisfactorily achieved since the two components are seldom in balance in the aggregate and less so in spatial terms. Research is not very close to isolating these interactions or constructing a generalised, aggregate, integrated model of the housing market.

The following proposed model of the urban housing market will accordingly be dissagregated into the influence of the decisions and behaviour of the consumers of housing and the influence of the decisions and behaviour of the agents of supply and allocation of housing on the operation of the housing market, as shaped and constrained by the overall socio-political and economic philosophy and ideology maintained by the community and various tiers of government. Notwithstanding the proposed dissaggregated exposition, it should constantly be borne in mind that the urban housing market operates as an integrated whole.

The disaggregation is extremely unsatisfactory and artificial and only undertaken for the ease of explanation.

A fundamental decision of each urban household (consisting of one or more members) wishing to locate or relocate in the city is where to live in the heterogeneous urban area. This decision is determined by the household's perception and self-estimation of its characteristics, requirements and own social standing and by its view of the housing, residential area and social characteristics and structure of the city as well as the household's self-placement within this self-generated view of the urban society.

The principal determinants which influence a household's choice to purchase a specific house are **firstly** the price of the house (in terms of rental, mortage redemption repayments or purchase value), **secondly** the type of housing and **thirdly** the house's location in relation to negative and positive externalities present in the physical and social environment of the surrounding residential area as well as its location in relation to the various places of employment of the household members, but most probably its location in relation to the place of employment of the head of the household.

These housing, residential area and locational characteristics have similarities in the attributes of the household making the choice of housing. The amount a household is prepared to pay is determined by its disposable income, the type of housing that it requires is determined by the household's age, size and composition, that is its stage in the family life cycle, while its life style preferences, ethnic origin, ethnic commitment and migratory history will determine the type of neighbourhood it would wish to settle in, the type of neighbours it would wish to associate with and how close to its places of employment it would wish to live.

The most important determinative factors in the selection of a specific house are thus the social status (socio-economic status and life style) and family life cycle (demographic composition) of the household. The income of the household will determine the price, in terms of rental or mortgage redemption payments, at which it can afford a house. For most income groups the ultimate price of a house is of secondary importance and the affordability of taxes, maintenance costs, mortgage repayments or the rental is the paramount consideration. The demographic composition of the household will determine the size of the house, since at different stages of its life cycle a household has very different needs in terms of space and other facilities. The life style and preferences of the household will also play an important role in determining the price and size of the house as well as the type of dwelling - a choice has to be made between single-family houses, duplexes, town houses, low-rise apartments and high-rise apartments.

After the selection of a dwelling in terms of price, size and type has been made (the housing-space needs of the households have thus been defined), a dwelling situated within the physical space of the urban area has to be located. This house will be situated within the preference space of the household. Household preference spaces come about as a result of the tendency of individuals and households to perpetuate social status distinctions by associating with and living close to people with a similar status. The demographic composition, life style and ethnic awareness and commitment are also important considerations in the household's decision on where to settle, but these are all secondary to the desire to be segregated in terms of social status.

Social segregation is achieved principally by people with high incomes pre-empting locations with positive spatial externalities and leaving areas with negative externalities to poorer households. There is a progressive decline in the power of pre-emption and locational choice with a decline in social status. The higher the social status of the household, the greater the power of exclusion and pre-emption and the greater the choice that can be executed. The lower the social status, the smaller will be the power and the smaller the choice.

The innumerable individual decisions of households on their eventual location create the segregated residential structure of new areas and adapt that of existing areas. This, however, is not a one-way process, since the existing ecology as perceived by the urban resident also influences and shapes his final locational decision.

When the financial ability, needs, aspirations and attitudes of the household intersect or show the greatest degree of correspondence with the price, quality and size of the house, its physical and social environment and its location, a decision to rent or purchase the house will be made. According to Wilkinson the housing consumption needs of a household are satisfied by the services rendered by housing. Equilibrium (and thus consumption of housing) will occur where there is an equality or near equality of services and needs (p. 73).

The findings of recent studies that have concentrated on the factors and agencies that affect, regulate and control the supply and allocation of housing, have severely undermined the idea of consumers having an unimpeded choice in dwelling selection, either in terms of type or location. These studies have also found that the segregated housing structure of urban areas is not the exclusive result of the behavioural decisions of consumers. There are always constraints of some kind present in the housing market and decisions are rarely, if ever, entirely in the hands of individual consumers. Gray argues that: "people are not free to choose and prefer from a range of options and ... the study of household units does not provide the key to understanding urban processes. Instead, many groups are constricted and constrained from choice and pushed into particular housing situations because of their position in the housing market, and by the individual institutions (i.e. building societies, estate agents, public and private landlords) controlling the operation of particular housing systems" (Kirby, D.A., p. 24). D.A. Kirby further states that even where freedom of choice does appear to exist, frequently the range of choices available has been predetermined by the decisions and actions of the agencies responsible for the supply and allocation of **housing**[2] resources" (p. 24).

[2] word added

The various agents responsible for the supply and allocation of housing are professionals and bureaucrats such as housing and welfare officials, local government officials and councillors, planners, landlords, land-owners, property developers, estate agents and financial institutions.

The behaviour and decisions of the suppliers of housing are controlled by and take place within a framework of manipulative legislation and public policy constraints formulated in terms of the social, economic and political ideology adhered to by the ruling political and community leaders. These public policy constraints regulate and determine the extent of the power of the suppliers of housing while they also determine which managers and gatekeepers will play a controlling role in the housing allocation process. The decisions of individual managers and gatekeepers on the distribution of housing resources are thus not made in isolation or independent of politico-economic influences (Kirby, D.A., p. 35). The intervention of, for instance, the State in the free interaction of supply and demand in the British housing market "has produced an easily identifiable bureaucratic layer in the British housing scene" (Kirby, D.A., p. 25). In South Africa the strict regulatory apartheid policy with its restrictions on the freedom of choice of housing consumers in respect of residential location has led to the partitioning of all urban residential areas in terms of four racial groupings (White, Black, Asian and Coloured) while in socialist Poland where a policy of equalised housing opportunities was implemented, the main feature of an ecological study of Warsaw undertaken by Weclawowicz in 1970, was the lack of residential segregation amongst the main occupational groups (Herbert et al.,

p. 302) - a characteristic rarely found in capitalist Western society.

The agents of supply and allocation of housing and the consumers of housing are thus subject to a set of "guidelines" that control their behaviour in the housing market. These guidelines include the legal system which defines property rights, the financial system which determines who gets what credit where and the national and local government policy system which determines urban growth and development, the extent of fiscal restraint and the uses to which buildings and land can be put. All housing transactions thus take place within the confines of established laws, rules and regulations. The power of the various agents of supply and allocation of housing varies over time and space and is significantly conditioned by the social, economic and political norms of the society in which the agents operate. Bourne (1976) thus correctly states that the agents of supply of housing do not operate within a uniform and unrestricted environment, neither are the suppliers themselves homogeneous in character or behaviour nor is their behaviour characterised by optimal decision-making (p. 130).

Through the provision of housing and residential environments from which consumers can choose, the agents of supply of housing have considerable power in shaping the social landscape of urban areas as well as the outcomes of the urban housing market.

A group of agents of supply of housing that exerts a primary influence on the supply of housing is the **public and private developers** of residential areas and new and refurbished housing.

These developers inject new developed residential land and housing into the existing system and it is their decisions as to what sort of houses are to be produced in which areas, that to a large extent control the present and future patterns of residential development in urban areas. The developer's decisions will be in response to his interpretation of the demands of the housing market at any one time. His perceptions are of course tempered and shaped by the existing aggregate ecology of the urban area in which he operates as well as his interpretation of the future expected demand of the various status groups for housing. The developer, however, has to operate within the confines of the existing planning framework. This and other legislation which influence and control his decisions and behaviour are also formulated, especially at the local level, after considering the problems and situation of the existing aggregate ecology of the urban area.

The operations of most private developers and builders are speculative and they only undertake developments if they can obtain a return on invested capital. To minimise the risk involved, private developers provide housing mainly for the middle- and high-income categories, leaving the provision of housing for the low-income categories to the local public sector. To satisfy the high-status social group's desire for positive residential externalities, builders and developers will construct housing and develop residential areas accordingly.

To maintain the provision of housing on all levels and also because of their vast land-holdings and the high cost of development of residential land, local authorities are forced to enter the housing market as developers and builders. Large profitable returns on invested capital are usually not prime considerations with local governments. They rather consider long-range social, economic and political objectives and decisions on the type of housing and residential area to be developed are taken on these grounds.

Thus, as D.A.Kirby states, "it is the decisions and behaviour of the builders and developers ... that control the contemporary pattern of residential development within cities. The social, economic and demographic characteristics of an area can be seen as the product of the decisions and activities of private **and public**[3] builders and developers regarding the size of the development and the type of housing constructed ... In this way **builders and developers**[4] greatly influenced the residential structure of cities ..." (pp. 29 - 31).

One of the principal agents through which the housing objectives of national and local government policy are transmitted to and made applicable to the urban housing market, is the **regional and town planner**. The power of town planners to exert an influence on the operation of the housing market varies considerably among societies. A close harmony exists between the intervensionist power of town planners and the degree of bureaucratic control of society. Regional and town planners in the United Kingdom and South Africa have much more legislative power than do their counterparts in the free enterprise capitalist society of the United States of America.

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[3] words added

[4] words added

Although town planners are not primary initiators of urban development or do not achieve major redirections in urban growth, they do modify and constrain the free interaction of market forces, do effect control over their main expressions and do have an effect upon the shape of urban development and upon the nature of housing and residential areas.

The framing of town-planning schemes and subsequent separation of land uses have had far-reaching implications for urban development. It has led to the creation of submarkets in terms of land use and has, through the belief in low and medium density housing, facilitated urban sprawl. This has subsequently led to an increase in development costs which is reflected in the high prices of urban housing. The stipulation of minimum building and residential development control regulations has also affected the residential environment provided to potential consumers of housing. By varying the minimum requirements in different sections of the urban environment, town planners direct and control the present and future development of the urban housing market. Areas where the minimum development requirements are of such a nature that only high-quality housing can be erected, will be pre-empted by the high-income segment of the urban community, while the areas where housing of a lesser quality is allowed will be left to the lower-income segment. This of course ensures that the social and residential segregation desired by high-status inhabitants is legislatively protected and guaranteed.

In the micro-economic models of residential location and the behavioural models of consumer decision-making and residential mobility, it is usually assumed that household income is the most important controlling factor in the choice of housing. This, however, is not correct since it is, for most people, the ability to obtain a mortgage or credit under suitable terms that is the immediate determinant. This ability is of course income-related but it is also a function of the policies of financial and governmental institutions (Harvey et al., p. 23).

For the majority of **financial institutions** that finance housing, the security of the loan and degree of risk are the overriding considerations in the decision to extend credit. In reaching a decision to grant a loan the creditworthiness of the applicant, the durabiltiy of the property, the ability of the property to maintain its value or to increase it and the resalability of the property, are all prime considerations. These criteria invariably lead to discrimination against certain types of properties, certain classes of households and certain residential areas.

Bias is usually exhibited against low-income households, households headed by manual workers and against older properties. Studies of the behaviour of financial institutions in Baltimore, Sacramento, Newcastle-upon-Tyne and Saltley have revealed that there is a strong positive association between mortgage lending and socio-economic status and a negative association with non-White residents and age of the property (Herbert et al., pp. 323 - 325).

Financial institutions often designate whole sections of an urban area as unsuitable for the purpose of granting a loan. Although individual households residing in these areas and individual houses situated there may be acceptable in themselves, the whole area is red-lined as undesirable and no loans are granted in respect of housing situated there. These areas are usually associated with, in the United Kingdom and the U.S.A., high concentrations of Coloured households (Kirby, D.A., p. 31) and in Bloemfontein with low-income households, scheme housing or negative physical externalities, expecially clay soils. Red-lining leads to neighbourhood instability and declining property values in areas inhabited by that segment of society that can least afford it - the economically and socially less well off.

In South Africa the mortgage repayments of approximately 70 % of White home purchasers are subsidised by their employers. This has the effect of "upgrading" the income component of the social status dimension of these purchasers in relation to their unsubsidised counterparts without a concomitant "upgrading" of educational and occupational levels. The "classical" constructs of the social status dimension as perceived in other westernised societies are thus distorted in South Africa and this has led to a blurring of the social status segregation of White society. It is often found that individuals and households with a relatively low status measured in terms of occupation and educational levels, live in areas that are on aggregate occupied by households of a higher status measured in terms of income, occupation and educational level.

The financial institutions in South Africa that finance the purchase of housing by the public in general, commonly apply a rule that a maximum of between 25 % and 30 % of the gross income of the head of the household (building societies) or of the husband and wife's income combined (banks) may be devoted to mortgage redemption. This results in households with certain incomes being assigned to houses below certain maximum price levels. The sequel to this practice is the segregation of society and segmentation of the urban housing market not due to the decisions and behaviour of the consumers of housing, but rather due to the actions of one of the agents of the supply of housing resources.

The managers of financial institutions and other institutions that extend financial assistance in respect of mortgage redemption are thus key figures in the private housing market and can, through the selective allocation and distribution of financial resources, regulate and determine present and future urban development, growth and redevelopment as well as augment the social segregation of urban society. "Regardless of the arguments in favour of a spatially or locationally differentiated investment policy, the results of such a policy can only take one form, a spatially differentiated set of house price trends" (Palm, 1979, p. 95) as well as the maintenance of the inequitable allocation of financial resources and consequential social segregation of the urban society.

Estate agents are an important link in the operation of the urban housing market. They serve as the principal broker between home purchasers, home sellers, landlords, financial institutions and property companies. Rossi found that in Philadelphia 50 % of movers had used estate agents although only 14 % had used them effectively, while in Swansea, Herbert found that 8 % of low-income respondents and 17 % of high-income respondents had used estate agents. The National Opinion Research Centre in 1971 asked recent movers to indicate which information source had been the most important to them in finding their present residence. Estate agents had been the most important source to 20 % of them while they had been the second most important source to all respondents. There had also not been a significant difference between income groups and to 19,2 % of low-income respondents and 21 % of high-income respondents, estate agents had been their most important source of information. Although surveys vary as to the importance of estate agents in property transactions, it has been estimated that in more than 75 % of property sales, estate agents have been involved in some part of the transaction (Palm, 1979, p. 97). Estate agents are thus important sources of information in the urban housing market and are a key link in transmitting information about neighbourhoods and communities to home sellers, purchasers and financiers.

Estate agents are, however, "not simply passive suppliers of information. Rather, they play an active part in the home-purchase decision by deliberately channelling the prospective purchaser into, or away from, specific areas" (Kirby, D.A., p. 25). This is done because they believe "that it was their duty to preserve the social and ethnic composition of neighbourhoods by ensuring that buyers were similar to present residents, and by directing persons of different races, religions, or economic classes to other parts of the city" (Palm, 1979, p. 97). Estate agents thus segment the housing market perceptually and behaviourally and tend to pursue their view of the segregated nature of the housing market by regulating the information supplied to purchasers and regulating the presentation of houses for sale to purchasers. A New-England study in 1953 showed that estate agents were directing ethnic groups to certain areas and away from other areas while in New Haven in 1968 a similar tendency was observed. Estate agents justified their actions on the grounds that it fitted in with the preferences of Black and White clients as well as the investment policies of financial institutions (Herbert et al., p. 325).

It has also been found that, over and above attempting to maintain the existing social status and ethnic differentiation of the urban housing market, some estate agents actually attempt actively to change the pattern of the housing market and to push residential area change into specific directions. Estate agents can, for instance, stimulate the gentrification of areas by pursuading financial institutions to lend money for the purchase and upgrading of obsolete properties as was found by Williams in Islington (Herbert et al., p. 326). Estate agents can also purchase properties, thus extending their roles to that of landlord, developer and speculator and can initiate the gentrification or deterioration of residential areas. The last can be done by introducing Blacks to White residential areas to stimulate the migration of Whites from these areas and thus changing the racial composition of such areas. Through the process of lily-whiteing or block-busting, estate agents ensure the racial ghettoisation of certain urban areas and thus control and direct the growth of Black areas (Herbert et al., p. 325). This is done because in the U.S.A. Blacks pay 2 % to 23 % more for similar properties than do Whites (Bourne, 1981, p. 1978). King and Mieszkowski found that in New Haven, Connecticut, Black households paid 11 % more for housing than comparable Whites while Kain and Quigley in St. Louis found that rents were 8 %

higher in Black than in White areas (Strazheim, 1975, pp. 68 - 69). The deliberate deterioration of residential areas is also sometimes encouraged to initiate the rezoning of the properties, for the eventual resale of the properties as prime redevelopment sites.

1.4 Integrated behavioural model: conclusion

The urban housing market is thus characterised by the confluence of the interests of a myriad of consumers and suppliers of housing resources who participate in the selection, production and allocation of housing units. The behaviour and decisions of consumers and producers of housing are, however, controlled and constrained by the general legislative fiats enacted by the ruling establishment. The consumers and suppliers of housing thus have to operate within the confines of a lattice of well defined "guidelines" that exert a great influence on and to a large extent control their behaviour and decisions.

Depending on the socio-political and economic ideology adhered to by national and local government and on an informal level by the local community, there will be variations in the importance of the role played in the housing market by the selectors of housing and the suppliers of housing. The ideology followed will determine the degree of governmental intervention in society and will consequently also determine which public and private agents responsible for the provision of housing will participate in the intersection of supply and demand and eventual allocation of individual households to specific houses, situated in specific locations and at specific prices. Thus supply considerations, under certain situations and in certain communities, will dominate the market at certain times or in specific sectors and areas at different times while under different situations and in other communities, demand will be the dominant process by which the housing market and its outcomes are shaped.

The urban housing market is primarily an economic instrument, operating within a specific social, economic and political framework, to bring together housing demand and supply for the purpose of exchanging resources - the resources being housing services.

A household's choice of a specific type of house (its housing space needs) is determined by its socio-economic status, demographic composition and life-style preferences. After the housing—space needs of a household have been defined, the type of house has to be located within the physical space of the spatial deployment of the residential areas within the city. The location of the preferred type of house is usually determined by the household's community-space preferences which is defined by its degree of awareness of the niche in the social status hierarchy that it occupies, the household's desire to give expression to and maintain this awareness (that is desire to be segregated in terms of social status), its ethnic awareness and commitment, life style, demographic composition and probably most important of all, the household's perception and awareness of the development of the established aggregate ecology of the city.

The character of social areas is, however, not solely the result of the demand for housing and housing consumers do not have an absolute free choice in the type of housing or its location. The demand of housing consumers is constrained and influenced by planning regulations and general legislation, the availability of finance and the activities of individual planners, estate agents and developers and builders. Although the provision of new and vacant houses is affected by general legislation, this in turn is formulated after consideration of the deployment of the aggregate ecology of the city.

Although formal town-planning schemes as legislative tool, the tendency of estate agents to channel prospective purchasers into housing situations as they see fit and the possible restrictions on financing for house purchases with the consequential limitation on the household's freedom to determine its own housing expenditures and to choose suitable housing, can and do affect the operation of the urban housing market, it cannot be assumed that these agents and legislation are wholly responsible for the operation and outcomes of the housing market in a free-enterprise economic system. It is especially in the owner-occupied sector that the housing stock and development of the urban ecology are a reflection of the initiative of the private developer and builder and of market demand.

1.5 Outcome of the operation of the urban housing market

1.5.1 Segregated residential structure

The principal outcome of the interaction between the behaviour and decisions of the consumers and agents of supply of housing is the development of an orderly social geography of urban residential areas where people and households of similar characteristics and needs are placed in houses of similar types clustered in specific spatial locations at any given point in time. This results in a segregated residential structure and a series of spatially separate housing submarkets or market areas which may be discrete or overlapping. According to Herbert and Thomas these submarkets form the mosaic of residential areas characteristic of cities (p. 277) and as Williams and Sennet have indicated, residential areas or sociospatial units provide an example of a coalition of interests for individuals and households who occupy a certain ecological niche within the urban residential pattern (Herbert et al., p. 275).

The findings of the vast number of urban ecological studies that had been undertaken by urban geographers in various countries of the world during the 1960's and early 1970's, albeit mostly in advanced Western countries, presented urbanologists with valuable insights into the differentiated nature of urban residential areas, the spatial occupancy patterns exhibited by the residential populations of urban areas and the resulting differentiated social structure of the residential component of these urban areas.

With the factor-analytical method of analysis having its basis in America, 90 % of all ecological studies have been undertaken in the U.S.A. while 99 % of all studies are applicable to cities of the highly developed Western world (Berry, 1971, p. 219). This has resulted in the generalisations that have been formulated in respect of the social and residential structure of the city and the spatial patterns displayed by the dimensions of residential and social differentiation, having been based on results from the Western and American case.

In the majority of ecological studies undertaken in the U.S.A. a socio-economic status factor, a factor which emphasises differences in life style, seen in terms of age-structures and the family life cycle, and an ethnic-status factor which identifies segregated minority groups, have been identified. If dynamic and structural variables were included in the study, a factor which measured the stability or growth and development of subareas was distinguished in one or other form. This fourth factor is sometimes referred to as a factor of mobility (Robson, 1973, p. 208).

Moving away from the "American case" but staying within the Western cultural context, the aforementioned four factors are not consistently identified. The socio-economic status and stages-in-the-family-life-cycle dimensions are distinguished in one or other form in most of the cases, but the ethnic-status and mobility factors fall away to be replaced by other factors. These new factors are the result of specific cultural elements present or cultural views held by the community or of constraints imposed on the free operation of the urban housing market by the behaviour and decisions of both the consumers and agents of supply and allocation of housing.

After undertaking a comparative ecological study of Cardiff, Swansea and Newport, as well as comparing his results with those of other British ecologists, D.J. Evans stated that the major dimensions which would emerge from factor-ecological studies of

British cities were generalised dimensions representing socio-economic status, tenure coupled with stages in the family life cycle and residential quality (p. 99). The components which he identified in Swansea and Cardiff were social status, tenure coupled to stages in the family life cycle, residential quality and urbanisation. Only the first three components were identified in Newport (Evans, p. 97).

Herbert who undertook an earlier ecological study in two of the cities studied by Evans, namely Cardiff and Swansea, distinguished similar components as Evans. The components that Herbert identified were housing conditions (a component associated with variables that had positive loadings with a particular housing district, above-average densities of occupation, large households and municipal housing), and housing conditions and social status (a component associated with variables indicative of poor housing and overpopulation), ethnic characteristics and social status and lastly, stages in the family life cycle (pp. 83 - 86). In a study of Sunderland, Robson (1969) distinguished the components social class, housing conditions and stages in the family life cycle (urbanisation). Two components of housing conditions are distinguished - one that associates positively with areas of poor housing and a second component that negatively identifies those areas of subdivided housing which have suffered a loss of value over time (p. 162).

Similar components were also identified by P. Norman in London, H.R. Wilkinson, R.N. Davidson and M.K. Francis in Hull, C.J. Thomas in Nottingham and the Centre of Urban and Regional Studies in Birmingham. Norman identified the components socio-economic status and rooming houses which are equivalent to the dimensions social status and residential quality of Evans' study. In Hull the components social status and overpopulation, tenure and amenities as well as rooming-house areas or areas of transition were discerned. In Nottingham the components social status, stages in the family life cycle and tenure and decline in residential status were distinguished. In Birmingham the components socio-economic status, stages in the family life cycle, rooming houses or areas of transition and municipal housing were identified (Herbert, pp. 98 - 99).

The social structure of British urban communities is differentiated in terms of a different totality of dimensions than those of American cities. The dimensions residential quality, municipal housing, rooming-house areas and tenure are distinguished in British studies because of the active role played by national and local government in the provision of housing. Approximately 40 % of all housing in Great Britain is provided by the public sector - something which is not found in the American housing sector. The degree of free enterprise present in the American housing market is thus absent in Britain. Public-sector housing is constructed in vast homogeneous council estates. The allocation of households to these estates and to specific houses within the estates is the prerogative of estate managers. There has been a tendency to allocate households of similar circumstances and characteristics, as perceived by the estate managers, to specific estates or areas within estates. A propensity has developed to allocate the poorest households to the poorest housing while the criteria for access to new housing seem not to be housing need but moral rectitude, social conformity, clean living and a "clear" rent book. There has also been a tendency in Greater London, as Parker and Dugmore have shown, to allocate Coloured tenants to the older, poorer quality estates (Kirby, D.A., p. 29). The socio-spatial structure of British urban areas is thus influenced by the selection and allocative behaviour of local authority managers - one of the group of agents involved in the supply and allocation of housing. Submarkets based on tenure are thus characteristic of the British housing market, this being due to the curious mixture of private capitalism and public welfare adhered to by the national and local government sector in Britain.

The ethnic-status dimension is also not present in British studies because substantially large ethnic minority groups are not found in British cities while, if such minority groups do appear, they have not differentiated into distinct subgroups as is the case in the U.S.A. In a study undertaken in Birmingham, P.N. Jones found that in areas where immigrants concentrated, people of colour formed on average 14,6 % with a maximum of 18,5 % of the population of the area. On the other hand, in Cleveland, Ohio, 80 % of the Black population had settled in areas of which 75 % or more of the population consisted of Blacks. Subareas of immigrants can be distinguished in Britian, but not subareas which are exclusively occupied by members of one ethnic group as is the case in America (Carter, p. 277). This can be ascribed to the underlying racial awareness and prejudice present in American society with its concomitant informal racial discrimination.

In Pedersen's ecological study of Copenhagen three basic factors emerged, namely urbanisation or family status, socio-economic status and lastly population growth and mobility. An ethnic-status dimension (racial or linguistic) did not emerge, since substantial minority groups do not exist in Scandinavia. Sweetser's study of Helsinki confirms the homogeneity of the population of Scandinavian cities, since a separate ethnic-status dimension is also not distinguished in Helsinki (Berry et al., 1970, p. 318). In Australasian factor-ecological studies the dimensions social rank and stages in the family life cycle were discerned as independent factors while ethnicity, when it was identified, was not independent but showed varying degrees of relationship with the other factors. In Brisbane ethnicity showed a weak association with neighbourhood variation in family composition while in Auckland, Canberra, and Melbourne it appeared to be more strongly associated with social rank (Timms, p. 84).

In factor-ecological studies undertaken in South African urban centres only socio-economic status and stages in the family life cycle are sometimes distinguished as independent dimensions. In seven studies[5] socio-economic status was identified as an independent dimension in four of the cities, namely Welkom, Kimberley, Bloemfontein and Windhoek. Stages in the family life cycle was discerned as an independent dimension in Kimberley, Bloemfontein and Empangeni. A socio-economic status coupled to stages-in-the-family-life-cycle dimension was distinguished in all seven urban centres (Bloemfontein: population 61 751; Empangeni: population 10 000; Kimberley: population 36 700; Ladysmith: population 13 500; Newcastle: population 24 200;

[5] Refer to Combrink, De Kock, Du Preez, Enslin (1978), Senekal (1977), Store and Van Zyl in Bibliography

Welkom: population 36 000; and Windhoek: population 32 887). An ethnic-status dimension was not identified in any of the urban centres although concentrations of Afrikaans and English-speaking inhabitants were found in Bloemfontein and Empangeni.

Clear-cut and independent socio-economic status and stages-in-the-family-life-cycle dimensions are most probably not identified in all the urban centres because of their small size. As Bourne and Barber have stated: "Most will agree that small towns and cities exhibit less clearly defined activity zones, more heterogeneous residential areas, and generally lower spatial differentials among most urban attributes" (p. 258). The most important differentiation, that of status, is identified as an independent dimension in the four largest cities while stages in the family life cycle as an independent dimension is only identified in the two largest cities and the smallest urban centre.

The most important dimension of differentiation of residential areas and indeed of any area in South Africa is that of ethnic (racial) status. This is due to the apartheid policy implemented by the ruling White South African community and its attending policy of the statutory segregation of residential areas on racial grounds. The absence of an ethnic-status dimension in all the urban centres investigated (except for a language differentiation in Bloemfontein and Empangeni) is due to the fact that in six of the seven studies - Kimberley is the exception - the residential differentiation of only the White residential areas was investigated. The Kimberley study investigated the differentiation of the White, Indian and Coloured residential areas separately. The residential areas of Blacks were not studied while an integrated model of the other residential areas was not formulated.

1.5.2 Spatial patterns of segregated residential structure

The dimensions in terms of which urban communities are differentiated exhibit constant spatial patterns. Socio-economic status exhibits a sectorial spatial pattern from the city centre, and stages in the family life cycle a concentric spatial pattern around the city centre with minority ethnic groups clustering in multiple nuclei. In contrast to the classical ecologists who viewed the three patterns separately as indicative of the total variation of the urban residential structure, later factor ecologists found, depending on the data used in the study, that any or all three patterns might be found in the city. R.A. Murdie found in Toronto that "the economic status dimension moved outwards in a general sectoral arrangement with the wedges of high and low status widening towards the periphery of the metropolitan area ... The family status dimension tended to move outwards from the city centre in a concentric fashion" (Carter, p. 270). Similarly Anderson and Egeland found in four American cities (Akron, Dayton, Indianapolis and Syracuse) that the economic status dimension displayed a sectorial pattern and the stages-in-the-family-life-cycle dimension displayed a concentric pattern (Robson, 1973, p. 213). Salins found in Indianapolis, Buffalo, Spokane and Kansas City that "ethnic groups will exhibit a clustered pattern reflecting voluntary or involuntary segregation" (p. 245).

Later factor-ecological studies did not find such clearly circumscribed distributional patterns. McElrath in Rome, Rees in Chicago, Johnson in Melbourne and Timms in Brisbane and Auckland found that socio-economic status and stages in the family life cycle exhibit both sectorial and zonal patterns (Robson, 1973, p. 214). Timms states in respect of Brisbane and Auckland: "In general social rank is distributed within the city along sectoral lines, while family status, ethnic status, and variables relating to community integration, follow essentially zonal patterns. Each index, however, shows some tendency to exhibit a secondary form of patterning: zonal in the case of social rank, sectoral in the case of family status and ethnic status" (p. 248).

Similar patterning was found in South African urban centres. Enslin in Empangeni and Store in Welkom found that socio-economic status exhibited a sectorial pattern but the pattern tended towards concentric circles. Combrink in Newcastle, Van Zyl in Ladysmith, De Kock in Windhoek and Senekal in Bloemfontein found that socio-economic status exhibited a sectorial distribution pattern. In Bloemfontein there is not an increase in status with an increase in distance from the CBD. Du Preez found that in Kimberley socio-economic status revealed no pattern at all. The dimension stages in the family life cycle, not being an independent dimension, only revealed a concentric pattern in Bloemfontein. In Ladysmith and Kimberley no pattern was discerned, while in Empangeni and Welkom there were very weak concentric patterns, but a relatively strong concentric pattern was found in Windhoek. The dominant pattern is sectorial as a result of stages in the family life cycle being coupled to the most important dimension - socio-economic status. Since an ethnic-status dimension was not identified in any of the studies, a corresponding spatial differentiation of the population was also not discerned. Owing to the involuntary segregation of race groups in South Africa, the major spatial patterning characteristic of South African urban populations is the clustering of race groups. All urban centres in South Africa , irrespective of size or location, have a clustering of ethnic (race) groups.

1.5.3 Social and residential structure: generalisations

Through the introduction of social, economic and geographic parameters in factor ecological studies a generalised urban ecology of the modern Westernised city has been developed. The following generalisations with regard to the social and residential structure of this city can be identified: the social structure of urban communities is differentiated in terms of two general dimensions, namely socio-economic status and family status. There are, apart from these general dimensions, also special dimensions in terms of which the urban social structure is differentiated. These special dimensions are a product and reflection of the socio-economic, political and cultural landscape in which the city is situated.

The emergence of independent socio-economic status and stages-in-the-family-life-cycle dimensions are, however, subject to certain conditions being present in society. The socio-economic status dimension will only appear if an operative social ranking system is employed, a desire exists for the members of the various status groups to live in specific residential areas and the housing market is subdivided to cater for the various socio-economic groups. Similarly, a stages-in-the-family-life-cycle dimension will only be spatially distinguished if provision is made in the housing market to accommodate each stage while the clarity of the ethnic-status dimension will be regulated by the extent to which a significant minority exists in society as well as by the extent of ethnic awareness and desire for ethnic preservation exhibited by the minority groups. Otherwise, although social and ethnic stratification may be real enough in the community, this stratification will not exhibit clear spatial expressions owing to the inadequacies of the housing market or owing to the preferences of those able to exercise or manipulate choice. In Europe and South Africa, where the degree of public intervention differs from that of the U.S.A., the emergence of a geographically segregated urban society in terms of social, economic and ethnic parameters is not realised while in socialist societies, where the key factor of differentiation (socio-economic status) has been removed, the applicability of the Western model of urban residential segregation is vastly reduced.

In ecological studies undertaken outside the Western cultural context and outside the modern city context, only a status differentiation has been discerned. Berry (1973) remarks with regard to ecological studies undertaken in a non-Western cultural context that: "Each of these studies usually identifies, first of all, the most important kind of differentiation. This is status differentiation" (p. 23). The distributional pattern of this dimension is also the reverse of that found in the modern Westernised city. Status is the highest around the centre of the city with the periphery being occupied by persons of the lowest status.

The family status factor is also not found in pre-industrial communities and there is a positive correlation between the degree of development of the factor and the degree of development of the urban community. "The absence of the life cycle differentiation also is characteristic of societies where families have not yet become specialized, where one still has the extended families as the basic form" (Berry, 1973, p. 23).

In Third World countries the basic need for shelter takes preference over other considerations, while the inadequate infrastructure and non-urban character of cities, the non-economic basis of many preference patterns, the extended family and the differing meanings attached to the concept of housing and residential area are all factors that give rise to a different urban ecology than that observed in Western and industrialised societies (Herbert et al., p. 307).

1.5.4 Pattern of property values

A secondary response to the interaction of the consumers and suppliers of housing is a spatial pattern of systematically varying property values across the urban housing surface. This is not unexpected, since both individual dwellings and residential areas are imbued with social and symbolic values and act as symbols of status and social position. Since wealth, power and status are generally associated, the status of an area is reflected in its property values (Herbert et al., p. 276) and generally there is a correspondence between the spatial pattern exhibited by the social status of an urban residential area and the spatial pattern of housing property values. Location thus reflects social characteristics and status in that a household chooses housing and chooses an area to give spatial expression to its image of its own social standing and status (Robson, 1975, p. 7) or is forced to choose a dwelling and residential area according to the perceptions of the wealthy and powerful - that section of society that has the ability to engineer the stratification and segregation of society according to its wishes and perceptions. Each higher societal status level is able to impose its goals and perceptions, as modified by the higher echelons of society, on to the lower participants in the society. In typically specialised and stratified Westernised societies, the social and economic roles of individuals and households are matched and given expression by the style of house and residential area they occupy. This mental representation of wealth, power and status is concretised by the price a household is prepared to pay for a house in a specific area and thus its concomitant property values.

The separated nature of Westernised urban society is thus the result of the intersection of a large number of vested interests, most of them selfish and having to do with the social and economic welfare of the ruling members of society - those with wealth, power and status at their command - rather than with society's overall welfare. To achieve their goal, these groups aspire to live apart from other groups. By using the power at their command, these groups formulate and manipulate societal attitudes and values, ensuring that their goals and values are imposed on the lower echelons of the urban society through the manipulation of the behaviour and decisions of the suppliers of housing and enactment of, to them, advantageous legislation. This guarantees the maintenance of their perceived social exclusivity through the establishment of segregated social areas.

The tendency of households of similar status to live together results in homogeneous areas of residential desirability. Entry to an area of higher residential desirability requires that a premium be paid for housing in the area in comparison to the price of similar housing in other areas of a lower status and a lower desirability. Since the desirability of residential areas is not homogeneous across an urban area, premiums at the same level will not be maintained. According to Bourne (1981) these varying premiums identify the existence of spatial submarkets or market areas (p. 87).

The price of housing and the pattern of varying property values across the urban surface are a response to the processes of residential location and allocation operative within the operational confines of the urban housing market, as well as to the pattern of housing submarkets or market areas across the aggregate housing market surface.

CHAPTER 2

LOCAL GOVERNMENT

2.1 Need for local government

The historical and modern urbanisation process has resulted in the development and establishment of urban communities with unique socio-economic, cultural, political and environmental structures and interrelationships. These singular structures and interrelationships flow from the internal and external relationships maintained and manifested by specific urban communities.

The unique externalities and internalities maintained by different urban communities have necessitated the establishment of local government institutions with limited and local governmental powers to provide the required legislative and executive powers and machinery to comply with the needs, requirements and aspirations of particular urban communities and to ensure the communal prosperity and welfare of the community.

The Committee on the Staffing of Local Government (the Mallaby Committee), 1967, stated that local government "...ensured that a wide range of interests and needs, both current and future, of the community were considered and evaluated so that the services and functions were shaped to meet those particular interests and needs" (Craythorne, p. 12).

The existence of local government to a great extent also alleviates the obligations of central government towards the inhabitants of the state. It is to the central government's advantage to sanction and foster the continued existence of local government, since the needs of spatially variable communities are not necessarily spatially neutral and the central government would find it extremely difficult to prescribe directives for such a large variety of requirements. Furthermore, the provision of buildings and staff for a number of different governmental departments to provide the required services and governmental functions in every community in a country would be extremely costly. It is also true that a locally elected representative body would be more concerned with and make more successful attempts to determine the real needs of the inhabitants of a local community. If, however, the majority of decisions of a local nature would have to be made in the capitol, the local community would not have a close identity with those who provide the services for them and may neither value these services nor co-operate with those who provide them (Craythorne, p. 18).

Accordingly all states with large territories have found it advantageous and necessary to organise public services in terms of smaller geographical areas and "except in states of the Monte Carlo or San Marino category, some or other form of local government appears to exist in most countries" (Meyer, 1978, p. 1). It should be noted that local governments do not operate autonomously from central government, but are influenced by and reflect the general character of the national constitutional regime of which they form a subordinate component.

The importance of local government as the basic component of a national governmental system was underscored by the Honourable P.W. Botha, DMS, MP, the then Prime Minister, on the occasion of the official opening of the Eightieth Congress of the Municipal Association of Transvaal on 12 October 1983 where he stated that the "Central government realises the importance of local government. ....Local government, well-organised and effectively carried out, forms the sound foundation of a democratic management of a country" (The South African Treasurer, November 1983, p.4).

In 1946 the Appellate Division (Feetham, A.J.A.) stated: "It may, I think, be safely affirmed that the main object of establishing municipal councils and similar bodies for purposes of municipal government, as understood and carried on in the Union of South Africa and in other British Dominions, is to enable representatives of given areas to administer, subject to some degree of control by a central authority, the local affairs of those areas in the general interests of their respective communities......" (Sinovich v. Hercules Municipal Council, 1946, AD 820).

2.2 Purpose of local government

"The usual rationale for local government, serving an area which is but a small part of a sovereign state, relates to perceived efficiency and democracy" (Johnston, 1983, p. 129).

Efficiency refers to the local provision of services to match the requirements of the local inhabitants. With elected politicians and public servants accountable to a local electorate, the provision of services that are locally controlled ensures that services of the kind, quality and quantity required are provided. The second purpose of local government relates to democracy; the involvement, at the local level, of inhabitants in the government of the state. Local government also serves as a counter to the potential of a centralised autocracy (Johnston, 1983, p.129).

Various authors and authorities have noted and expounded this twofold purpose of local government. Samuel Humes and Eileen Martin maintain that the purpose of local government "... is the administrative one of supplying goods and services, the other is the 'representative' one of involving the citizens in determining specific local public needs and how they are to be met ...." (Meyer, 1978, p.13).

The Ontario Committee on Taxation expressed a similar opinion. Local government firstly provides an opportunity and legal instrument for local inhabitants to participate in the governmental process (albeit mainly in respect of local affairs). It secondly enables the local community to control the provision of local services - that is the economical discharge of public functions as well as the achievement of technical adequacy in due alignment with public needs and desires (Meyer, 1978, p.13).

Local government thus enables local inhabitants to participate in governing their specific local affairs and to regulate and develop local affairs. It secondly allows local communities to render specific services and goods in accordance with immediate local needs and expected future needs.

The political and service demands of local communities manifest a spatial variation resulting from the externalities and internalities peculiar to individual communities. Local government, in contrast to a centralised administrative and political authority, can respond readily and satisfactorily to these spatially variable political and service demands.

2.3 Characteristics of local government

Emanating from the need and purpose of local government, local government can be described, according to M.P. Barber, as:

1) a governmental system subordinate to the central government, although not acting merely as an agent thereof;

2) involving administration of functions on a local scale, even though such functions may be properly classified as national in character;

3) consisting of locally elected representatives undertaking the administration of the local unit as against administration by servants of the central authority;

4) essentially providing community services for the benefit of the local community without any clear distinction between national and local affairs (Meyer, 1978, p.11).

A succinct description of the characteristics of local government is also presented by Meyer. He states that the following could be considered characteristics of local government:

"1. a local area and a local community formed and kept together by common interests;

2. participation by a local community in the government of its local affairs; and

3. a local political unit endowed with corporate status vested with subordinate governmental powers and powers of taxation to control, regulate and develop local affairs and to render specific local services" (Meyer, 1978, p.11).

2.4 Income of local government

The authority and functions of local government in South Africa are conferred on local authorities by the central government in terms of the Republic of South Africa Constitution Act, No 110 of 1983. Under section 84(1)(f) of the Republic of South Africa Constitution Act, No 32 of 1961, as amended in Part 1 of Schedule 2 of Act No 110 of 1983, all municipal matters were transferred to the provincial authorities. The provincial authorities had in turn promulgated various ordinances to regulate and determine the organisation, power and functions of local authorities.

With the introduction of the new tricameral governmental system and the formulation of the concepts "general affairs" and "own affairs" (Part IV of the Constitution Act No 110 of 1983) - local affairs" (Part IV of the Constitution Act No 110 of 1983) - local government being classified as own affairs (Item 6 of Schedule 1 of the Constitution Act No 110 of 1983) - Ministers' Councils have been created in each of the three houses of parliament to deal with and control own affairs. Each Ministers' Council has a minister whose portfolio includes local government. The three ministers are the Minister of Local Government, Housing and Works: House of Assembly; the Minister of Local Government, Housing and Agriculture: House of Delegates; and the Minister of Local Government, Housing and Agriculture: House of Representatives.

The de jure position at present is that there are three Ministers of the Ministers' Council with portfolios which include control over local government. In practice, however, local government is still being controlled by the provincial administrations. Certain components of local government identified as general affairs will probably remain under control of the provincial administrations, while those identified as own affairs will be transferred to the administration of the House of Assembly, the House of Delegates and the House of Representatives.

The various prescriptive provincial ordinances controlling the valuation function will thus most probably be repealed in the near future and be replaced by a single act, thus resulting in a single basis of valuation being applicable in South Africa for White, Coloured and Indian local authorities.

South African local authorities are thus constitutionally subordinate to the central government.

Notwithstanding their subordinate governmental status, local authorities have to discharge manifold functions, powers and duties. To achieve the diversity and multiplicity of objectives attending local government in general and required by the local electorate in particular, local authorities are forced to incur expenditure and accordingly have to command adequate revenue resources to meet this expenditure.

2.4.1 Sources of income

The central and provincial governments have through legislation and various other regulations granted local authorities the required financial ability to proceed reasonably autonomously with the process of government at the local level. Provision has been made for own sources of income that are not in conflict with the financial sources of the higher governmental institutions as well as for the partial or full reimbursement for services or goods rendered by local authorities on behalf of the central government or provincial authorities. It is a characteristic of the South African local governmental system that services or goods provided solely for the welfare or in compliance with the requirements of the local inhabitants, should be financed by the local inhabitants through the local authority. Services or goods provided for the welfare or in compliance with the requirements of a wider population or wider purpose are partially or fully the responsibility of the central or provincial governments and regional services councils. For instance, for services rendered by local authorities in terms of the Health Act, No 63 of 1977, local authorities are partially reimbursed.

Meyer (1978) states: "The local community elects and controls their local government and should, therefore, pay for the services they demand ..... This contribution by the social unit gives it a right to control ... But it also moderates demands for services. The purse of the local community is much smaller than that of central government. The financial viability of the local political community determines the extent and nature of the services which can be rendered by its local authority" (p. 81).

Although there are a wide variety and large number of specific sources of income available to South African local authorities, these sources can be grouped into four general categories: taxation of fixed property; service charges; levies, licences and miscellaneous income; and subsidies received from the central and provincial governments (Kotze, 1976, pp. 127 - 143; Kotze, 1978, p. 9; Cowden, p. 70).

Various authorities on local government have included loans as a source of income, but Kotze (1976) states that loans acquired by local authorities cannot be seen as a source of income, but should be seen as a source of financing to create assets (Cloete, 1982, p. 267; Botha, 1969, p. 413; Craythorne, p. 208; Kotze, p. 268).

Specific sources of income of local government in different countries vary considerably but, notwithstanding this variability, the sources of income of local governments in all Western countries can be grouped into the four general categories previously mentioned. Barlow asserts generally (for Western countries) that for "the revenue side of the budget equation local governments depend upon a combination of taxes, loans, and transfers from higher levels of government; and these may be supplemented by income from the operation of revenue-generating public services such as utilities and recreation facilities, and by fines levied for infringements of regulations and laws" (p. 28). With regard to local government in Great Britain, the income of local authorities is derived from local rates (tax on fixed property), central government grants, trading services to a limited extent due to the nationalisation of utilities and miscellaneous sources, which include charges for personnel services such as the provision of police at public functions, charges for work done (for example the making of private streets), and charges for facilities provided, including rents from council housing, fees and tolls. Borrowing is also a source of income, but as in the case of South African local authorities, it is employed to acquire and create tangible and private assets (Jackson, p. 242, p. 268, p. 269).

Depending on the ruling socio-political and economic philosophy maintained by the national government, the "mix" of sources of income available to local government as well as the contribution of the various sources to the total income package of local government will vary greatly in the various countries of the world. Where political democracy with a free-market economic philosophy exists at national level, local governments will enjoy a substantial degree of political and fiscal autonomy.

Political and fiscal autonomy at local level will, however, decrease with an increase in authoritarianism at national level or if a philosophy of the central control of political and economic systems is subscribed to by central government.

Political and fiscal autonomy implies that local authorities should possess independent and self-generated financial resources (granted, however, by the central government) that are not in conflict with the financial resources of the higher tiers of government. Reliance on these independent sources of income increases with an increase in political or fiscal autonomy. In centralised economic and political systems where local government has very little autonomous power, there is a greater dependence on revenue transferred from higher levels of government.

Traditionally, in South Africa as well as other major Western countries, taxes on fixed property have been the major independent and self-generated source of income available to local authorities.

Accordingly Cowden states in respect of the tax levied on fixed property in South Africa that it "is a primary revenue source for local government, it is essentially local, provides a direct link between the elector and local government and has been an important factor in local autonomy" (p. 359). Meyer (1978) is of the opinion that the "basis of the financial ability of local government in South Africa is property tax ... Real property taxation remains however the main source of income" (p. 63).

In respect of local government in the United States and Great Britain in particular and local government in general, Barlow expresses the same supposition. "The tax revenues available to

Table 2.1 SOURCES OF LOCAL AUTHORITY INCOME: VARIOUS COUNTRIES (PERCENTAGES)

	South Africa[a] (1976/77)	USA[b] (1975)	Canada[b] (1976)	West Germany[c] (1974)	Denmark[c] (1973/74)	Netherlands[c] (1975)	Sweden[c] (1975)
Taxes:							
Property	23,0 %	25,0 %	31,0 %	4,6 %	5,0 %	6,0 %	-
Trade	-	-	-	17,6 %	-	-	-
Income	-	-	-	17,6 %	37,0 %		65,0 %
Other	1,2 %	11,0 %	5,3 %	1,2 %	2,0 %	-	-
Total taxes	24,2 %	36,0 %	36,3 %	41,0 %	44,0 %	6,0 %	65,0 %
Other	18,5 %	29,9 %	11,2 %	-	2,0 %	6,0 %	-
Trading services	53,4 %	-	-	36,0 %	-	-	-
Subsidies & grants	3,9 %	33,5 %	46,5 %	23,0 %	54,0 %	88,0 %	35,0 %
Total income	100,0 %	99,4 %	94,0 %	100,0 %	100,0 %	100,0 %	100,0 %

[a] Suid-Afrika (Republiek), Verslag van die Komitee van Ondersoek na die Finansies van Plaaslike Besture in Suid-Afrika, Vol. 3, p. 110, p. 111, p. 122 and p. 123 (Browne Commission). The statistics have been compiled from Schedules 2.8 (p. 110), 2.9 (p. 111), 3.8 (p. 122) and 3.9 (p. 123) of Vol. 3 of the report of the Browne Commission.

[b] Suid-Afrika (Republiek), Verslag van die Komitee van Ondersoek na die Finansies van Plaaslike besture in Suid-Afrika, Vol. 3, p. 100. The statistics are expressed as a percentage of the current and capital expenditure. Canada had a shortfall of 6,0 % and the USA 0,6 %.

[c] Kotzé, 1980, pp. 133 - 134.

local governments are diverse: income taxes, sales taxes, property taxes and special taxes unique to an area may all be involved. However, prime dependence is upon property taxes, whether levied on property owners, as in North America, or on occupants, as in Britain's rates system; and other taxes tend to be relatively unimportant. Consequently for most local governments the property tax is a major source of revenue, and it is also the most important source within their direct control; since they usually perform the task of property value assessment, they establish rates of tax, and they have complete discretion over how the monies raised are allocated among government functions" (p. 29).

From table 2.1 it is clear that the largest source of income available to South African local authorities is charges levied for the rendition of trading services. These services include the provision of electricity, gas, water, transport, abattoir facilities, fresh-produce markets, breweries and the sale and distribution of alcoholic beverages (53 %). The second largest contribution to total income is by tax levied on fixed property (23 %). Income from other sources (18,5 %) ranks third most important and represents income from functions that do not entail profit-taking, such as personnel protection, community development, community services, miscellaneous services and housing. Other forms of taxation (mainly licences) represent the smallest contribution to total income at 1,2 % of total income.

Taxation of fixed property is thus a major source of income available to South African local authorities. This predominance is further elucidated by a comparison between the sources of income of local authorities in South Africa and those of various other countries as set out in table 2.1.

Of the seven countries mentioned, only Sweden does not levy a direct form of taxation on fixed property. In Sweden the value of fixed property does, however, play a role in the determination of the level of local income tax levied.

The taxation of fixed property as a source of income plays a very minor role in West Germany, Denmark and the Netherlands and in all three countries taxation of fixed property represents less than a fifteenth of the total current income of local authorities. South African, Canadian and American local authorities, in contrast, rely heavily on this source of income and it contributes 23 %, 31 % and 25 % respectively to the total current income of local authorities.

The application of subsidies and grants as income sources also differs vastly between Canada, the USA and the European countries and South Africa. The local authorities in the Netherlands receive 88 % of their income from higher government authorities, while 54 % of the income of local authorities in Denmark, 46,5 % in Canada, 35 % in Sweden, 33,5 % in the USA and 23 % in West Germany is derived from the higher tiers of government. Against this, South African local authorities are not as dependent on the central and provincial governments for additional income and these higher government authorities subsidise only 3,9 % of the total current income of municipalities in South Africa. These figures confirm one of the most important aspects of local government in South Africa: The cost of services and goods required by the local electorate is borne by the local electorate.

It should be noted that local authorities in the four European countries, Canada and the USA do, however, perform certain duties that are traditionally those of the central and other higher tiers of government, such as, to mention a few, the provision of a police force, schooling, health services and the registration of births and deaths. In South Africa these duties are performed by the higher government authorities. The extended functions provided by local authorities in these countries necessitate the financial assistance provided by higher government authorities to local government. Further, the implementation of a well developed socialist policy in the European countries has influenced all forms of government administration and service rendition. This, in turn, has to a certain extent given rise to the amplified role of central-government financing of local-authority functions.

With a subsidy of 3,9 % of their total current income available from central and provincial governments, South African local authorities must thus rely heavily on the direct contribution of their citizens for the financing of non-trading services.

The contribution of various types of properties to the total income derived from property tax for 1977/78 is reflected in tables 2.2 and 2.3 for seven categories of municipal-type local authorities.[1] The figures in table 2.2 are based on the assumption

[1] The municipal-type local authorities identified by the Browne Commission are: Group 1 - metropolitan core cities; group II - cities forming part of metropolitan areas but with an independent economic base; group III - cities situated in metropolitan areas but economically dependent on the group I and II cities (group III cities are also known as dormitory towns); group IV - non-

Table 2.2 PROPORTIONAL CONTRIBUTION OF PROPERTY TYPES TO THE TOTAL INCOME ON PROPERTY TAX IF TAX IS LEVIED ON LAND ONLY: 1977/78[a]

Types of properties	Local authority categories							
	I	II	III	IV	V	VI	VII	I-VII
Residential properties	56,2	59,7	79,6	58,3	60,3	75,5	75,5	59,8
Central business properties	23,6	8,8	4,9	24,3	23,6	16,5	16,3	18,9
Other business properties	19,0	19,2	7,9	14,5	12,1	5,5	5,8	17,0
Agricultural properties	1,2	12,3	5,8	2,9	3,9	2,5	2,3	4,3

[a] (Suid-Afrika (Republiek), Verslag van die Komitee van Ondersoek na die Finansies van Plaaslike Besture in Suid-Afrika, Vol. 1, p.106)

Table 2.3 PROPORTIONAL CONTRIBUTION OF PROPERTY TYPES TO THE TOTAL INCOME ON PROPERTY TAX IF A UNIFORM TAX IS LEVIED ON LAND AND BUILDINGS: 1977/78[a]

Types of properties	Local authority categories							
	I	II	III	IV	V	VI	VII	I-VII
Residential properties	62,6	66,8	82,5	61,7	63,8	74,9	74,9	65,5
Central business properties	19,0	7,5	4,6	19,6	18,8	15,6	15,6	15,5
Other business properties	17,6	18,1	9,4	17,2	15,2	8,4	8,5	16,4
Agricultural properties	0,8	7,5	3,6	1,4	2,3	1,1	1,0	2,6

[a] (Suid-Afrika (Republiek), Verslag van die Komitee van Ondersoek na die Finansies van Plaaslike Besture in Suid-Afrika, Vol. 1, p.106)

that only land is taxed. A constant factor is applied in the calculation of the tax. The calculations supply a reasonably good indication of the proportional contribution of the four types of properties to the total income from taxation.

As control, calculations of the income from rates for the four types of properties, based on a uniform rate being levied on land and buildings, are set out in table 2.3. In comparing tables 2.2 and 2.3 it would appear that there is not a large deviation between corresponding amounts. As can be seen from table 2.2, residential properties contribute 59,8 % of the income derived from property tax, central business area properties 18,9 %, other business area properties, which include industrial and mining land, 17,0 % and agricultural land situated in municipal areas contributes only 4,3 %, provided that agricultural land is taxed at a fifth of the value of other land uses.

It would further appear that central business properties plus other business properties contribute relatively more to the total income from property taxes in the larger local authorities (groups I, II, IV and V) than in the smaller local authorities (28,0 % to 42,6 % against 12,8 % to 22,1 %). Against this we find that in the smaller local authorities (groups III, VI and VII) more than three quarters of their income from rates is contributed by residential properties (75,5 % to 79,6 %). In

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metropolitan cities; group V - large towns mainly serving rural areas; group VI - towns mainly serving rural areas and group VII - small towns mainly serving rural areas. Other types of local authorities identified by the Commission but not included in the analysis are urban administration boards, rural administration boards, development boards and rural water-service corporations. (Suid-Afrika (Republiek), Verslag van die Komitee van Ondersoek na die Finansies van Plaaslike Besture in Suid-Afrika, Vol. 1, p. 7).

contrast, less than two thirds of the income from rates of the larger towns is contributed by residential properties (56,2 % to 60,3 %).

Residential properties are thus a major source of income from taxes for local authorities.

2.4.2 Property tax: Criticism

The levying of a tax on fixed property as a source of public income has been fiercely and vociferously attacked by academics and laymen alike. The most caustic and eloquent attack could probably be ascribed to Seligman: "Practically, the general property tax as actually administered is beyond all doubt one of the worst taxes known in the civilized world. Because of its attempt to tax intangible as well as tangible goods, it sins against the cardinal rules of uniformity, of equality and of universality of taxation. It puts a premium on dishonesty and debauches the public conscience; it reduces deception to a system; and makes science a knavery; it presses hardest on those least able to pay; it imposes double taxation on one man and grants entire immunity to the next. In short, the general property tax is so flagrantly inequitable, that its retention can be explained only through ignorance or inertia. It is the cause of such crying injustice that its alteration or its abolition must become the battle cry of every statesman and reformer" (Seligman, E.R.A., p. 33 as quoted in Kerrigan, p. 38).

Although improvements have been brought about in the administration of property tax and the base of property tax has been restricted to easily discernible, tangible assets - principally fixed property - the tax has in the past been and is still being criticised continually since Seligman's attack launched in 1895.

The criticism most generally levied against the property tax can be categorised as 1) defects fundamental to the property tax per sé; 2) defects related to the levying of the tax by various local authorities in one metropolitan area and 3) defects resultant of the quality of administrative performance - that is, the assessment function (Netzer, 1974, p. 193).

Taking cognizance of the purpose of this study a detailed discussion on defects related to administrative quality will be presented under a separate section. To maintain a complete representation, a passing reference only will be made to the first two categories of defects.

2.4.2.1 Defects fundamental to the property tax

1) The defect most commonly mentioned in both popular and academic discussion on property tax is the regressivity of property tax. Regressivity implies that the lower the property owner's income (or the income of the person responsible for the payment of the tax), the higher the proportion of his income paid in respect of property tax.

There are two reasons for the regressivity of property tax in respect of residential property. The first reason is shortcomings in the administrative quality of the assessment function. The second reason, and in the opinion of Netzer (1966), the more adequate explanation for property tax regressivity, is that expenditure on housing exhibits a relatively low order of income elasticity in that, at any one time, families with a higher income spend proportionally less for housing services than do lower income families. A survey undertaken in the USA during 1960 revealed that median tenant families with an income between $10 000 and $15 000 per annum were spending less than twice as much for rent as median tenant families with an income of $2 000 per annum. It was further found that the median family with an income of $3 200 per annum was spending between 25 % and 35 % of its income on rent, while the median family with an income of $8 500 per annum was spending only 10 % of its income on rent (p. 57).

The same survey also found that the value of housing increased at a lower rate than income. The highest income group had an income ($15 000 per annum) 7,5 times larger than the income ($2 000 per annum) of the lowest income group. At the same time, however, the higher income group occupied housing with a median value ($27 5000) only 4,3 times higher than the median value ($6 400) of the lower income group (Netzer, 1966, p. 264). The aggravating circumstance is of course that the tax levied on property is a proportional tax. Thus there is no progression built into the marginal tax scale (Botha, 1969, p. 435). As property tax is based on the value of fixed property, we find that a larger proportion of the income of lower income families is paid in respect of property taxes than is the case for higher income families.

2) Property taxes are inflexible and lack an adequate growth capacity to meet the increased fiscal demands of local authorities. Property taxes are thus not elastic enough to keep trend with rising prices as well as to finance the growing demands placed on local authorities. We thus find that the growth in revenues from property tax lags behind rising costs associated with the provision of public services. Associated with this restraint is "the fact that at the local community level the pressures to check rising tax rates are both considerable and successful; for example local politicians are reluctant to raise property tax rates in the fear that they will lose development to neighbouring jurisdictions, or because they anticipate hostile reactions from citizens and community groups" (Barlow, p. 30). Accordingly it has indirectly become public policy to retard, as far as possible, the growth of the property tax yield. This is largely due to the view that the property tax is unfair or inequitable (Johnson, p. 22).

3) Property tax does not take ability to pay into consideration nor does it bear any relationship to the consumption by individuals of local government services. The property owner who has no income, such as a widow or minor child, is still liable for the payment of property taxes.[2] Botha (1969) states that "property tax is having a most undesirable sociological effect in that rates sooner or later become prohibitive to fixed income earners" (p. 436). It may also be found that certain local income earners make extensive use of municipal services, but pay no property tax, while in certain instances industrial and

[2] The granting of deferment of the payment of property tax in respect of retired persons, has to a certain extent lessened their property tax liabilities.

commercial enterprises pay vast amounts of property tax but have no local vote - thus taxation without representation (Jackson, p. 263).

4) Owners of fixed property may be deterred from improving their properties as improvement invariably leads to revaluation with consequential higher property taxes. As the property tax amounts to a high consumption tax on housing, it can lead to a reduced consumer demand for housing and can accordingly limit the growth of the housing stock and also limit the improvement of existing housing (Netzer, 1966, p. 187).

5) Property taxes fall particularly heavily on residential property owners, especially owner-occupiers, as they are not able to shift the tax to anyone or are not able, as in the case of commercial and industrial undertakings, to shift the additional expense resultant of property tax onto consumers (Aaron, p. 212). Residential property owner-occupiers can also not class property tax as an expense to be charged against income in computing profits (Jackson, p. 263).

6) Property taxes are directed at the taxation of only one asset, fixed property, while the canon of ability to pay requires that the whole asset position of individuals be considered. "In Elizabethan times a person's visible property - mostly land and buildings - was fair evidence of his ability to pay, a fact which no longer holds in a modern industrial society" (Botha, 1969, p. 396). Today we find that most persons who are financially strong have a well differentiated asset portfolio and accordingly only a portion of their assets is taxed. Against this we find

that the financially less strong probably have most of their financial ability structured around one asset, their residence, and therefore these people are consequently taxed on a far larger proportion of their total wealth.

7) The levying of a tax on fixed property can disrupt the operation of the housing market. By placing a tax on a commodity, it must either lead to an increase in the price of the commodity or lower the profit a supplier can earn. In either case, property tax will lead to a lower level of supply of the commodity. An increase in property taxes may thus directly lead to a lower supply of new housing, or it may discourage the upgrading and rehabilitation of the existing housing stock and accelerate the decision of landlords in low-income areas to abandon their housing completely (Petersen et al., p. 2).

2.4.2.2 Defects related to the levying of the tax by various local authorities in one metropolitan area

1) The large differences in the land use, population density, population composition and size of various local authorities encountered in a single metropolitan area can result in a difference in the value and composition of the tax base of the local authorities. Consequently a wide variation in the scope and quality of local authority services may be found in one metropolitan area. Large tax base differentials can lead to land-use planning decisions being made on the strength of fiscal criteria in order to strengthen the tax base of the local government by promoting lucrative types of developments, rather

than basing the decisions on broader social, economic and aesthetic considerations (Netzer, 1966, p. 187).

2) Differences in the effective rate of property taxation can lead to less-than-optimal locational patterns of commercial establishments as these tax rate differences could lead to the relocation of commercial enterprises wishing to enjoy the benefit of lower tax rates (Netzer, 1966, p. 188).

3) High property tax rates may make central business district locations relatively unattractive for certain types of business and could be a contributing factor to the present disaggregation of the central business district (Netzer, 1966, p. 187).

4) The housing market will also be affected by variations in the effective rate of property taxation since a prudent household will compare tax burdens before deciding where to live (Petersen et al., p. 2).

2.4.2.3 Defects resultant of the quality of administrative performance

The nature of the quality of the valuation function rendered - that is the administrative quality of the valuation function and consequential scope of the taxes levied - has given rise to the property tax being attacked as a source of income exploited by local authorities. "Poor administration, ..., is one of the primary factors leading to the unpopularity and lack of general respect of the tax" (Pomp, p. 124fn) while "inadequate or incompetent administration of the property tax results in a great deal of injustice and inequity in distributing the cost of government ....." (Municipal Finance Administration, p. 11, as quoted in Kotze, 1976, p. 44).

The determination of the value of fixed property for the purposes of municipal taxation, in the majority of cases, rests on the subjective decision of the valuator on the market value or replacement cost of assets that are not exchanged frequently. This subjective determination of the values of fixed property frequently places the judgement of the valuator and consequently the equitability of the property tax under suspicion and has resulted in the accusation of the poor administrative performance of the property tax.

2.4.3 Property tax: Advantages

Notwithstanding the criticism levied against the property tax, various authorities have expressed reservations about these criticisms and have countered by cataloguing the advantages of property tax as a source of income available to local authorities. With regard to the regressivity of property tax, Aaron is of the opinion that: "Nearly all popular discussions of property tax take its regressivity for granted .... I conclude that the property tax should not be thought of as regressive unless or until a model can be found to justify this view .... While the trend away from property tax may properly continue it should not be justified by the view that its burdens are distributed regressively" (p. 212, p. 214, p. 220).

With regard to the criticism that the property tax does not reflect ability to pay, Mr D. Shaw, Q.C., stated before the Wilson Commission that the immediate former South African Minister of Finance, Mr Owen Horwood, giving evidence before a Select Committee, had said that "one mustn't be deluded by this notion of ability to pay because it doesn't mean an actual ability to pay, it means that you measure the man's ability to pay by a set standard, the standard is a valuation of immovable property, ..." (Province of Natal, Commission of Enquiry: City of Durban, p. 78). Bennet is of a similar opinion and states that "wealth is a measure of ability based on the stock of resources, and is relevant when considering property and estate duty taxes (p. 160).

The advantages of the property tax can be catalogued as follows:

1) The single most important advantage of the property tax is that it is localised within the specific area of a local authority and is an important factor in the affirmation of local autonomy. "...the property tax... is closely and perhaps uniquely linked to local autonomy... local government is most important where property taxation is heavily relied upon" (Netzer, 1966, p. 173). The amount of property tax payable is a function of a factor applied to the assessed value of immovable property - a factor that is self-determined - while the property tax as source of income would not come into conflict with the revenue sources of the central or provincial governments should they seek more revenue (Cowden, p. 104).

2) The property tax is a simple tax that is easily understood by the tax payer - being a function of a factor applied to the assessment of his property. If the property owner is not satisfied with the assessment of his property, he has recourse, at minimal costs, to the Valuation Appeals Board (Jackson, p. 262). The payment of the tax is further convenient to the payer as accounts clearly indicating the amount due are normally rendered with ample time in which to pay without penalty. Provision is also made for payment by instalments (Cowden, p. 102).

3) Property tax is a stable source of income for local authorities, as it is based on an immovable and visible asset and is accordingly a tax that cannot be evaded through the removal or concealment of the asset. The local authority thus knows exactly how much the property tax is going to realise (Jackson, p. 262).

4) The property tax is an economical tax as the collection costs are reasonably low. When the property tax payable has been fixed, the collection and administration follow a set routine. There are further no complex forms to be completed or analysed. The valuation procedure, valuation court and granting of deferment of payment of the property tax do add to the administrative costs, but in general as much as possible of the income generated from property tax is spent on the provision of services and not on administration (Cowden, p. 102).

5) The property tax has a certain measure of elasticity as it can be adjusted to meet additional burdens without social disruptions (Cowden, p. 103). The property tax can thus be

changed annually by small increments to meet the requirements of the community. Tension is reduced through this flexibility (Netzer, 1966, p. 170).

6) There is no intrusion into the home nor any requirements to disclose income unless application is made for deferred payment of the property tax (Jackson, p. 263).

2.4.4 Property tax: Future as source of income

The increased urbanisation of the South African population, the general growth in the urban population and the evolution of a more sophisticated urban society, with the accompanying desire of the urbanite to improve his quality of life, have led to an increase in the demands placed on local government for administration and rendition of services. Not only is there a demand for an increase in the quantity of services provided, but also in the quality of the services. It would appear that each generation seems to demand more and better services than did the previous one - a swimming pool is no longer desirable, but one of Olympic standard is - the increased mobility of the population not only necessitated the improvement of existing roads, but the construction of freeways. All this has led to a dramatic increase in the scope of local government activity. Local government in South Africa is involved in town planning, urban freeways, health services, parks and beaches, libraries, art galleries, housing administration, traffic control, industrial development, urban renewal and the clearance of slums and blighted areas. (Botha, 1969, p. 434). The remarks of Plunkett in respect of the expanded functions of Canadian local authorities are just as applicable to the local situation: "In this way local government activities which were once 'narrow in scope ... considered purely local in their effect' and which consisted of 'relatively inexpensive maintenance and regulatory activities' have undergone 'startling change in their conception and an expanded degree of activity within each function'" (Barlow, p. 32). All this has led Botha (1969) to conclude that "the property tax now has to contribute to various other services which show no relation to the original purposes of a tax on property" (p. 434).

The expanded functions and duties of local government have in turn led to increased expenditure obligations.

The payment of property taxes is for most electors the only contact with the local government and these taxes thus have a very high political profile and sensitivity. Consequently local politicians have shown an aversion to increasing the tax rate to prevent any anticipated hostile reaction from citizens and local community groups. This aversion, combined with the limited growth of the property tax base, has resulted in the proportional contribution of the property tax to the total income of South African local authorities showing a marked and steady decline. To compensate for this, local governments have expanded their trading functions and have been using profit-taking from these trading functions to supplement any deficit in the income of Rate and General Services. This deficit amounted to 3,3 % in 1976/77 and 5,9 % in 1977/78 of the income of Rate and General Services (Suid-Afrika (Republiek), Verslag van die Komitee van Ondersoek na die Finansies van Plaaslike Besture in Suid-Afrika, vol. 3, p. 104 and p. 110).

In order to determine the trend in the percentage contribution of income from property tax, income from trading services and income from other sources[3] to the total income of local authorities[4] in South Africa in general and Bloemfontein Municipality in particular,[5] ordinary linear regression was performed between the independent variable time, in years from 1949 to 1982 ($x_i = t_i - 1949$, t_i ≡ years, 1949, 1950, ..., 1982) and the dependent variable percentage contribution of the three sources of income to the total income of South African local authorities and Bloemfontein Municipality (y_i).

Tables 2.4 and 2.5 display the intercept (α), the regression coefficient (β), the correlation coefficient (R), the coefficient of determination (R^2), the calculated F-ratio, the mean ($\bar{y}_i$), the standard deviation (S_y) and the coefficient of variation (V_y) of the percentage contribution of the three sources of income to the total income of South African local authorities and Bloemfontein Municipality respectively.

Since all the calculated F-ratios exceed the tabled F (1; 32; 0,95) = 4,17 the hypothesis $H_0 : \beta = 0$ is rejected in respect of all six regression analyses and it can be concluded at level $\alpha = .05$ that significant correlation exists. As the test $H_0 : \beta = 0$ against $H_a : \beta = 0$ in the case of ordinary linear

[3] Other income compromises income from licencing, personal protection, community services, community development, miscellaneous services, housing (mainly income on rentals and interest) and subsidies.
[4] The income of Divisional Councils is not included.
[5] The income of Bainsvlei was not analysed as this area does not comprise an urban area per sé but consists mainly of small-holdings. Langenhoven Park, the only urban development in Bainsvlei, was only established during 1981 - a period too short for meaningful analysis.

regression is equivalent to the test $H_0 : \beta \neq 0$ against $H_a : \beta = 0$ it can also be concluded that the regression coefficients in all cases differ significantly from zero and at level $\alpha = .05$ there is significant regression. The data in all six analyses therefore exhibit at the .05 level a significant linear trend.

Table 2.4 ORDINARY LINEAR REGRESSION OF PERCENTAGE CONTRIBUTION OF VARIOUS SOURCES OF INCOME TO THE TOTAL INCOME ON TIME; SOUTH AFRICAN LOCAL AUTHORITIES: 1949 - 1982

	α	β	R	R^2	F-ratio	$\bar{Y}i$	Sy	Vy
Property tax	23,105	-0,234	-0,892	0,796	124,82	19,25	2,61	13,56
Trading services	45,612	0,373	0,922	0,851	182,35	51,76	4,02	7,78
Other services	31,281	-0,139	-0,570	0,325	15,40	28,99	2,43	8,37

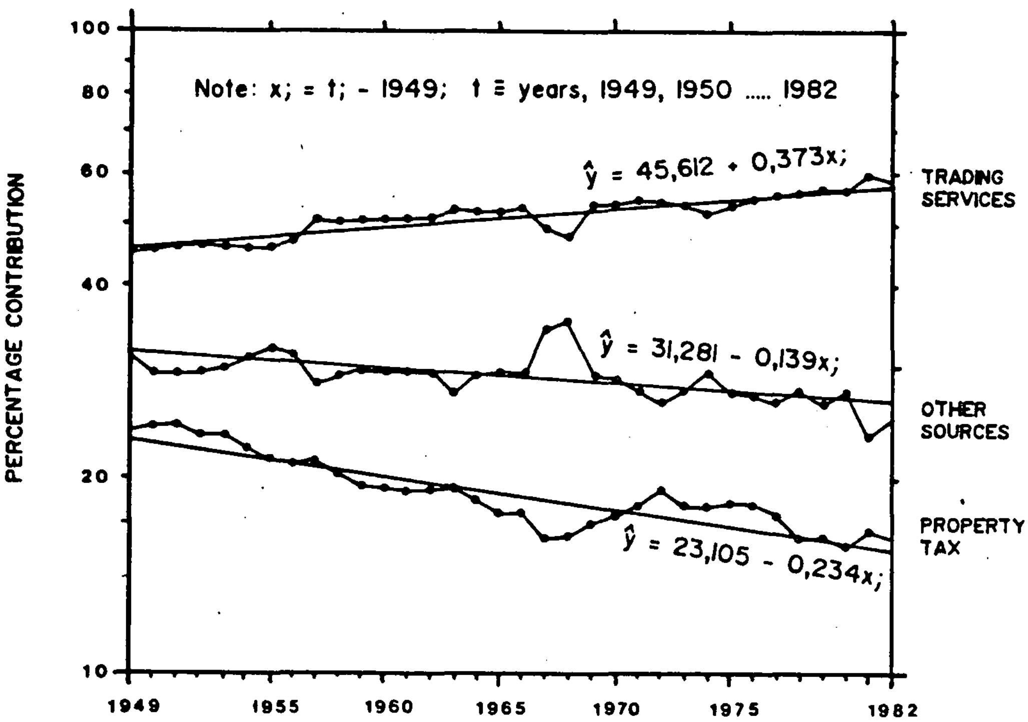

DIAGRAM 2.1 PERCENTAGE CONTRIBUTION OF PROPERTY TAX, OTHER SOURCES AND TRADING SERVICES TO THE TOTAL INCOME OF ALL LOCAL AUTHORITIES: SOUTH AFRICA: 1949 - 1982

These trends are reflected visually in diagrams 2.1 and 2.2 for all South African local authorities and Bloemfontein Municipality respectively. A summary of the percentage contribution of the various sources of income is set out in tables 2.6 and 2.7.

Table 2.5 ORDINARY LINEAR REGRESSION OF PERCENTAGE CONTRIBUTION OF VARIOUS SOURCES OF INCOME TO THE TOTAL INCOME ON TIME: BLOEMFONTEIN MUNICIPALITY: 1949 - 1982

	α	β	R	R^2	F-ratio	$\bar{Y}i$	Sy	Vy
Property tax	20,031	-0,221	-0,646	0,417	22,90	16,39	3,40	20,75
Trading services	42,86	0,560	0,869	0,945	172,71	51,02	5,97	11,70
Other sources	37,04	-0,341	-0,821	0,746	76,19	32,07	3,93	12,25

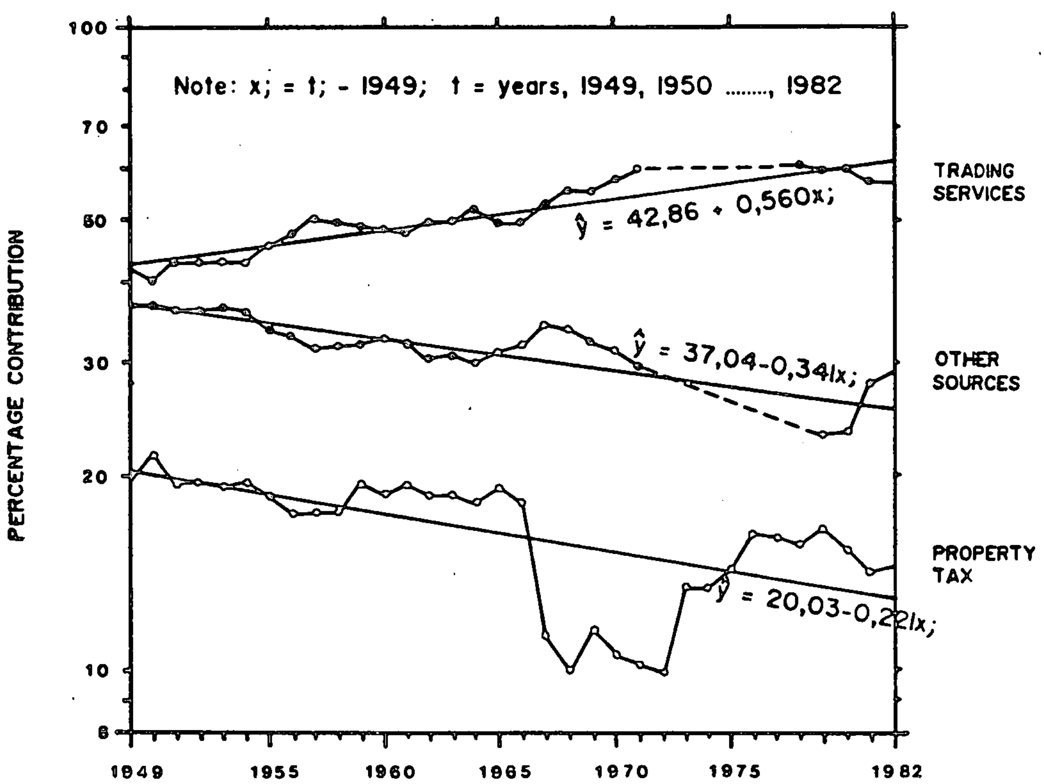

DIAGRAM 2.2 PERCENTAGE CONTRIBUTION OF PROPERTY TAX, OTHER SOURCES AND TRADING SERVICES TO THE TOTAL INCOME OF BLOEMFONTEIN MUNICIPALITY: 1949 - 1982

For all local authorities the percentage contribution of property tax has from 1949 to 1982 shown a compounded rate of decline of 1,22 % p.a., the percentage contribution of other sources a compounded rate of decline of 0,48 % p.a. and the percentage contribution of trading services a compounded growth rate of 0,73 % p.a. The income sources of Bloemfontein Municipality have shown a corresponding trend with the percentage contribution of property tax exhibiting a compounded rate of decline of 1,36 %

Table 2.6 PERCENTAGE CONTRIBUTION OF PROPERTY TAX, OTHER SOURCES AND TRADING SERVICES TO THE TOTAL INCOME OF SOUTH AFRICAN LOCAL AUTHORITIES FOR SELECTED YEARS: 1949 - 1982

	1949	1950	1955	1960	1965	1970	1975	1980	1982
Property tax	23,93	24,55	21,46	19,51	17,90	17,61	18,53	15,64	16,09
Trading services	45,01	45,54	46,45	50,97	52,83	53,61	53,87	57,31	59,59
Other sources	31,06	29,91	32,09	29,52	29,27	28,79	27,60	27,05	24,31

(South Africa (Republic), South African statistics 1982, p. 19.21).

Table 2.7 PERCENTAGE CONTRIBUTION OF PROPERTY TAX, TRADING SERVICES AND OTHER SOURCES TO THE TOTAL INCOME OF BLOEMFONTEIN MUNICIPALITY FOR SELECTED YEARS: 1949 - 1982

	1949	1950	1955	1960	1965	1970	1975	1980	1982
Property tax	19,95	21,74	18,85	18,89	19,13	10,58	14,56	15,47	14,42
Trading services	42,32	40,58	44,50	48,64	49,75	57,90	NA	60,69	56,77
Other sources	37,74	37,67	34,66	32,46	31,12	31,52	NA	23,85	28,82

(South Africa (Republic), Statistical yearbook 1964, p. S- 5; Statistical yearbook 1968, p. 4 - 5; Statistical yearbook 1972, p. T-7; Bloemfontein (Municipality), Financial statements, 31 March 1975, 31 March 1980 and 31 March 1982).

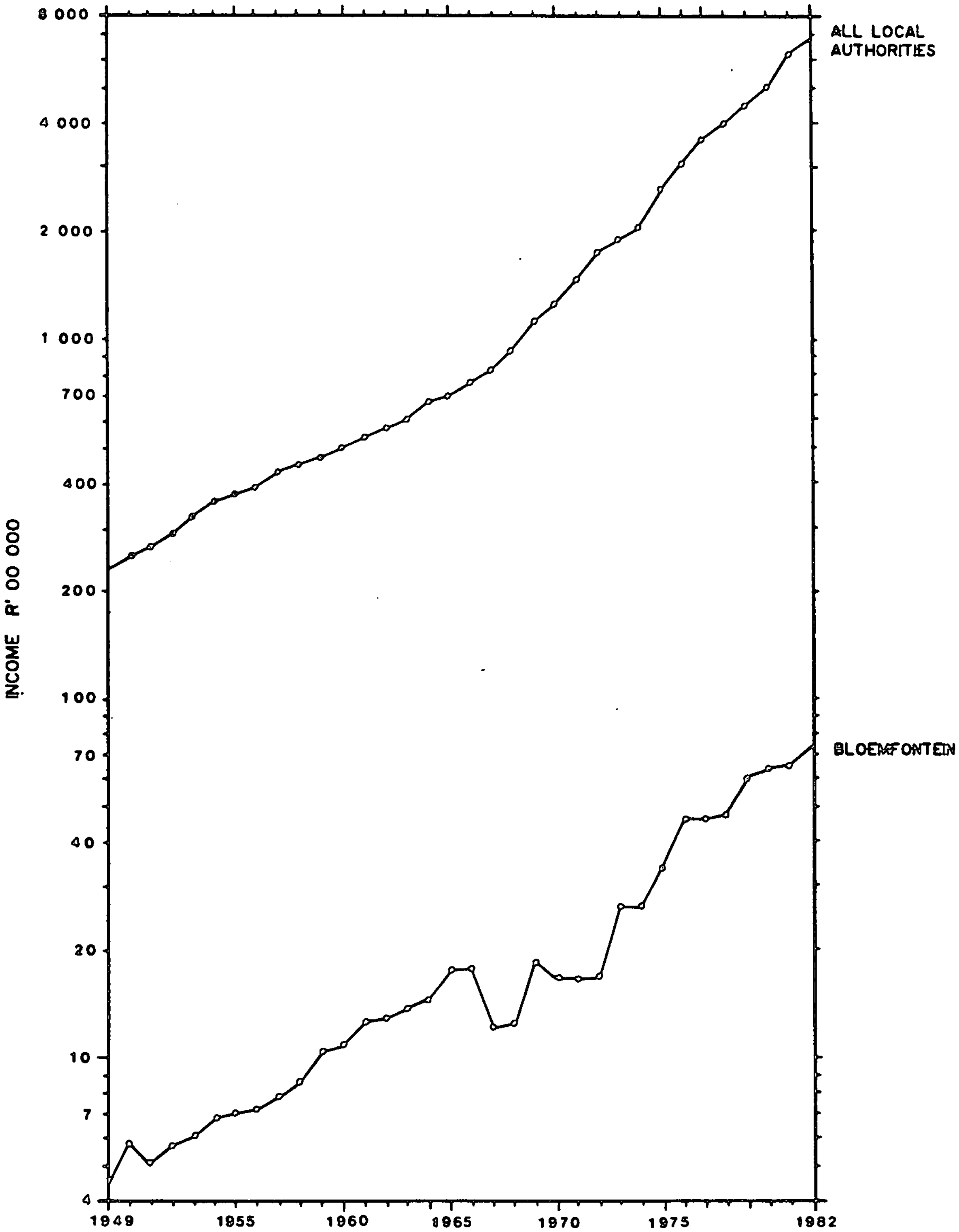

DIAGRAM 2.3 PROPERTY TAX INCOME OF ALL LOCAL AUTHORITIES AND BLOEMFONTEIN MUNICIPALITY: 1949 - 1982

p.a., the percentage contribution of other sources a compounded rate of decline of 1,09 % p.a. and the percentage contribution of trading services a compounded growth rate of 1,09 % p.a.

In comparing the means of the corresponding sources of income for all local authorities and Bloemfontein Municipality, it appears that the means of the percentage contribution of trading services do not differ significantly. The mean percentage contribution of other sources of income is higher for Bloemfontein than for all local authorities (32,07 > 28,99) while the mean percentage contribution of property tax is lower in the case of Bloemfontein than that for all local authorities (16,39 < 19,25). The reason for this could be ascribed to Bloemfontein being the judicial capital of South Africa and the provincial capital of the Orange Free State. Subsidies from central and the provincial government in respect of property tax and services rendered would thus be much larger than is the case for most of the other local authorities in South Africa. The exceptions, most probably, will be Pretoria and Cape Town.

The aforementioned does not imply that income generated by the property tax is showing a decline or that this source of income is in jeopardy of being discontinued. On the contrary, the income derived from property tax for all local authorities has from 1949 shown a compounded growth rate of 10,74 % p.a. and that of Bloemfontein Municipality a compounded growth rate of 8,8 % p.a. The income derived from property taxes, subsidies excluded, for all local authorities and Bloemfontein Municipality is reflected visually in diagram 2.3.

The central government through its Permanent Finance Liaison Committee is at present investigating various methods by which the income base of local authorities could be broadened and made more flexible to meet the changing demands placed on local government. A step in this direction has been taken by the central government through its decision to pay property taxes on all previously non-rateable state-owned properties. The implementation of this decision will be completed in 1985 with the "full agreed amount" being paid in 1985 (The Star, 31 March, 1982, p. 6).

A rebate of 20 % in respect of property taxes payable on all state and provincially owned properties and properties in the ownership of state-subsidised organisations with a 10 % rebate on property taxes payable by the South African Transport Services and the Post and Telegraph Services would probably be made applicable according to Mr G. Croeser, Deputy Director-General of Finance (Beeld, 26 February, 1983, p. 2).

For the 1986/1987 financial year the South African Transport Services and the Post and Telegraph Services paid the full 90 % while the state paid 57 % of the full property taxes. The slowdown by the state in the proposed implementation period is largely due to the recession experienced in the South African economy in general.

Although the taxation of fixed property has been widely criticised - and justifiably so, since it does have certain defects - the public interest is not in abolishing the property tax as a source of income available to local government, but rather in the minimisation of the defects and the enhancement of the efficiency of the tax.

J. Burkhead underscores the positive elements of the property tax: "On the whole ... the property tax is a far better fiscal instrument than most of its critics have allowed. There is every reason to believe that it will continue to hold its relative fiscal importance in state-local public finance structure ... Although the property tax has long been condemned by students of fiscal affairs, its recent behaviour suggests that it would be far better to strengthen this levy than to plan for its eradication" (Kerrigan, p. 40).

CHAPTER 3

PROPERTY VALUATION: ROLE IN PROPERTY TAX

3.1 Introduction

The contribution of individual property owners in various land use categories or zonings to the proportion of the total income of local authorities derived from property taxes and other taxes (T) based on the valuation[1] of fixed property is a function of two basic variables: the randage[2] (r) and the valuation of fixed property (Av). Thus

$$T = f\ (r,\ Av)$$

The two basic variables can be disaggregated into a myriad of combinations, depending on:

1) whether more than one tax is levied on the assessed value of fixed property;

2) whether different randages are applied to the components of total assessed value, assessed value of land and assessed value of improvements;

[1] For stylistic reasons the expressions assessed value and valuation are used reciprocally.
[2] The expressions randage (as used in South Africa) and millage (as used in the U.S.A. and Canada) have a similar application; to denote the rate applied to the assessed value of fixed property to determine the property tax and other taxes, based on the assessed value of fixed property, to be levied. The mill rate = 1/1 000 U.S. dollars and the randage rate = 1/100 South African rands.

3) whether different randages are applied to properties in different land use categories, land use zonings, valuation categories, locational categories, etc; or

4) whether a combination of the previous options is applied by various local authorities. The various combinations of randage and assessed value are a function of the statutory regulations applicable to the taxation of fixed property under which local authorities operate, the influence of special interest groups within the local political organisation, the present requirements of the local community and the short- and long-term political, economic and social objectives of the community.

The total valuation AV_j of fixed property j comprises two elements; the valuation of land AVL_j and the valuation of the improvements AVI_j. Thus

$$AV_j = AVL_j + AVI_j \tag{3.1}$$

The importance of the valuation function in determining the property tax and other taxes T_{ij} based on the land valuation AVL_{ij} and valuation of improvements AVI_{ij}, at randages r_l, $l = 1,2,\ldots,p$ (which is applied to the land valuation) and randages s_l, $l = 1,2,\ldots,p$ (which is applied to the valuation of improvements) for taxes l, $l = 1,2,\ldots,p$, which are levied on property owner $j, j = 1,2,\ldots,n$ in land use category or zoning $i, i = 1,2\ldots,q$ is demonstrated by the equation

$$T_{ij} = (r_1 , AVL_{ij} + r_2 . AVL_{ij} + \ldots + r_l , AVL_{ij}) + (s_1 . AVI_{ij} + s_2 . AVI_{ij} + \ldots = s_l . AVI_{ij}) \tag{3.2}$$

$$T_{ij} = AVL_{ij} \; (r_1 + r_2 + \ldots + r_l) + AVI_{ij} \; (s_1 + s_2 + \ldots + s_l) \tag{3.3}$$

$$T_{ij} = AVL_{ij} \sum_{l=1}^{p} r_l + AVI_{ij} \sum_{s=1}^{p} s_l \tag{3.4}$$

$$i = 1,2...,q$$

$$j = 1,2,..,n$$

$$l = 1,2,..,p$$

The randages r_l applied to the n properties in each land use category or zoning i, i = 1,2,...,q are equal to the ratios of the income obtained by local government $I[G]L_l$ from the various taxes l, l = 1,2 ,...,p levied on the valuation of land in each land use category or zoning to the total land valuation ΣAVL_{ij} of the n properties in each land use category or zoning, so that

$$r_l = I[G]L_1 / \sum_{j=1}^{n} AVL_{ij}, I[G]L_2 / \sum_{j=1}^{n} AVL_{ij}, ..., I[G]L_p / \sum_{j=1}^{n} AVL_{ij} \tag{3.5}$$

$$r_l = I[G]L_l / \sum_{j=1}^{n} AVL_{ij}, l = 1,2,...,p \tag{3.6}$$

The randages s_l applied to the n properties in each land use category or zoning i,i = 1,2,...,q are equal to the ratios of the income obtained by local government $I[G]I_l$ from the various taxes l,l = 1,2,..., p levied on the valuation of improvements in each land use category or zoning to the total valuation of improvements ΣAVI_{ij} of the n properties in each land use category or zoning, so that

$$s_l = I[G]I_1 / \sum_{j=1}^{n} AVI_{ij}, I[G]I_2 / \sum_{j=1}^{n} AVI_{ij}, ..., I[G]I_p / \sum_{j=1}^{n} AVI_{ij} \tag{3.7}$$

$$s_l = I[G]I_l / \sum_{j=1}^{n} AVI_{ij}, \quad l=1,2...,p \tag{3.8}$$

From equations (3.4), (3.6) and (3.8) the total income of local government from taxes p based on the land valuation and valuation of improvements of n properties in q land use categories or zonings is

$$\sum_{i=1}^{q}\sum_{j=1}^{n} T_{ij} = \sum_{i=1}^{q}\sum_{j=1}^{n}\left[AVL_{ij} \cdot \sum_{l=1}^{p} r_l + AVI_{ij} \cdot \sum_{l=1}^{p} s_l \right] \tag{3.9}$$

$$\sum_{i=1}^{q}\sum_{j=1}^{n} T_{ij} = \sum_{i=1}^{q}\sum_{j=1}^{n}\left[AVL_{ij} \cdot \sum_{l=1}^{p} \frac{I[G]L_l}{\sum_{j=1}^{n} AVL_{ij}} + AVI_{ij} \cdot \sum_{l=1}^{p} \frac{I[G]I_l}{\sum_{j=1}^{n} AVI_{ij}} \right] \tag{3.10}$$

$i = 1,2,\ldots,q$

$j = 1,2,\ldots,n$

$l = 1,2,\ldots,p$

3.2 Valuation of fixed property for tax purposes

In South Africa the owners of fixed property within a municipal area are liable for payment to the local authority of property tax and various other taxes based on the valuation of their properties. The legal provisions regulating the powers, duties and functions of local authorities in respect of the valuation of fixed property as well as the taxes that can be based on the valuation of fixed property, are extremely extensive. This section will accordingly be confined to a discussion of the basis of valuation of fixed property and the taxes that can be based on these valuations.

The applicable regulatory legislation is contained in various provincial ordinances. The relevant legislation is Municipal Ordinance No 20 of 1974 and Valuation Ordinance No 26 of 1944 in the Cape, the Local Authorities Rating Ordinance No 11 of 1977 in the Transvaal, the Local Government Ordinance No 8 of 1962 in the Orange Free State and Local Authorities Ordinance No 25 of 1974 in Natal.

3.2.1 Valuation of land

The basis of the valuation of land in the four provinces is essentially similar.

In Natal the basis of valuation is set out in sections 155(5) and 155(7) of the Local Authorities Ordinance.

> "(5) The value of the land shall be the ordinary price which a buyer would have been willing to give and a seller would have been willing to accept if the land to be valued had been brought to a voluntary sale on the fixed date and if the ownership of the land was not encumbered by any limitations other than those limitations which confer benefits of any kind upon property situated within the council's area of jurisdiction or by limitations which have been imposed by the council or any other statutory body."

> "(7) Where, owing to infrequency of sales or other reasons, the purchase price obtained or obtainable in any locality, ..., will not, in the opinion of the valuator, serve as a sufficient guide to enable him to arrive at a fair and equitable valuation of any property (whether land or buildings), then the rental, productivity or the possibilities of any such property as an investment, shall

be considered in establishing the basis of and finally determining the valuation of the property; provided that the ownership in the property is not encumbered by any limitations other than those limitations which confer benefits, of any kind, upon other property situated within the council's area of jurisdiction or by limitations which have been imposed by the council or any other statutory body."

Although the two subsections can be interpreted as providing alternative methods of establishing the value of land, Mr Broome, A.J. in judgement delivered in the matter D. and W. Grant Investments (Pty). Ltd. (applicant) and the Town Council of the Borough of Ladysmith and the Rates Appeal Board of the Borough of Ladysmith (respondents) stated that: "In my view these two subsections do not provide alternative methods of establishing the value of land, that is to say, ..., they are not mutually exclusive. The dominant and in fact the only criterion is the market value i.e. the willing buyer/willing seller as contained in subsection (3).

In the application of this test the valuator must have regard to each and every factor which would influence the imaginary buyer and the imaginary seller to settle on a fair price" (D. and W. Grant Investments (Pty.) Ltd. vs. the Town Council of Ladysmith and 1 other, 1975).

Mr Broome goes on to state: "Now one of the factors which the valuator must, quite obviously, take into account in assessing the market value of the land is any possibilities which it may have as an investment ... I experience a certain amount of difficulty in appreciating how the rental and productivity test can be of any assistance in a case such as this where the problem is to assess the market value of land as if it were vacant land. The rentals would seem to have more bearing on the value of the buildings and vacant land in the commercial centre of town would, I imagine, have very little rental potential. Be that as it may, subsection (5) in my view really adds nothing to subsection (3), it simply acts as a reminder to valuators" (D. and W. Grant Investments (Pty.) Ltd. vs. the Town Council of the Borough of Ladysmith and 1 other, 1975).

Although the judgement refers to sections 109(3) and (5) of the Local Government Ordinance No 21 of 1942, sections 155(5) and (7) of the Local Authorities Ordinance, which replaced the previous Ordinance, are substantially the same.

In the Orange Free State section 106(1)(a) of the Local Government Ordinance stipulates:

> "(a) 'value of land' means the estimated amount which such land would realize if placed in the open market for voluntary public sale: Provided that when a building on mining land is not exclusively used for mining purposes or for purposes incidental to mining operations, such land shall be valued only to the extent to which it is set aside for or in connection with the said building and without regard to the presence of minerals below the surface; ...".

The value of land is not to include any improvements, trees, shrubs or plants on the property (section 105(2), Local Government Ordinance, 1962).

In the Cape the legislature prescribes in section 43(1) of the Valuation Ordinance that: "The basis of valuation of land shall be the ordinary price which it is estimated a buyer would be willing to give and a seller would be willing to accept if the land to be valued were brought to voluntary sale at the time of valuation."

In contrast, in the Transvaal, instead of describing the basis of valuation of land, section 9(1) of the Local Authorities Rating Ordinance prescribes the duties of a valuer to determine improved value, land value and value of improvements of fixed property.

> "9(1) Subject to the provisions of section 38(1) of the Sectional Titles Act, 1971, the provisions of any other law and the succeeding provisions of this section, a valuer shall, for the purpose of the Ordinance, determine -
>
> (a) the improved value of land or the improved value of a right in land which shall be the amount which such land or right in land would have realized if sold on the date of valuation in the open market by a willing seller to a willing buyer;
>
> (b) the site value of land or the site value of a right in land which shall be the amount arrived at in a like manner to that referred to in paragraph (a), but on the

assumption that the improvements, if any, had not been made; and

(c) the value of improvements which shall be arrived at by subtracting the site value of land or the site value of a right in land from the improved value thereof."

The valuation procedure in the Transvaal thus differs appreciably from those of the other three provinces. The valuation procedure leads to the peculiar situation where the property as improved is firstly valued, thereafter the site as undeveloped is valued and these values are then subtracted to arrive at the value of improvements. Section 1(xiii) of the Local Authorities Rating Ordinance defines "'improvements' in relation to land or any right in land, [as] any building, whether movable or immovable, or any other immovable structure in, on or under such land or pertaining to such right excluding a structure constructed solely for the purpose of rendering the land concerned suitable for the erection of any immovable structure thereon."

Any retaining walls, piling, fill or cut erected or performed to make the site suitable for the erection of any immovable structure thereon cannot be classified as improvements and valued as such for the purposes of section 9(1)(c) of the Local Authorities Rating Ordinance. As provision for the valuation of such retaining walls, piling, cut and fill as well as garden development is made in the improved value of land (section 9(1)(a)) but not the value of improvements (section (9)(c) read together with section 1(xiii)), the value of these improvements has to be reflected in the valuation of the site. However, the value of retaining walls, piling, cut, fill, garden walls, garden patios and the like not performed or erected to make the site suitable for the erection of immovable structures thereon, has to be included in the valuation of improvements.

The willing buyer/willing seller and voluntary sale concepts form the basis of valuation of land as if unimproved in the four provinces, save for the peculiar constraints in the Transvaal.

The assessed value of land AVL_{ij} of property $j, j = 1,2...,n$ in land use category or zoning $i, i = 1,2,...,q$ is therefore equal to the market value of land.

That is: $AVL_{ij} = MVL_{ij}$ (3.11)

In contrast to the situation in the United States of America where, in the majority of states, it is legally required that assessed values for tax purposes be established at a percentage of full market value, no such requirements are operative in South Africa. Thus valuation of land for municipal tax purposes must be at 100 % of full market value.

In 1900 all states in the U.S.A., except Illinois and Iowa, required that assessed values be at 100 % of market value. In 1961 the number of states (including the District of Columbia) that required 100 % assessment ratios (assessment-sales ratios are expressed as a percentage ratio of assessed value to market value) were reduced to 38 while in 1971 22 states subscribed to this requirement. This of course does not imply that any of the assessments performed in the various states were at the required legal assessment-ratio standard. During 1971 the median assessment ratios varied between 4,1 % in South Carolina (legal requirement 100 %) and 86,3 % in Oregon (legal requirement 100 %) while the average of the median assessment ratios for all states was 34 %. The smallest legal ratio requirement was stipulated by Idaho at 20 % of full market value while the actual median assessment ratio was at 10,5 % of full market value (Plattner, pp. 18 - 19).

In the U.S.A. the assessed value AV_{ij} of property $j, j = 1,2,\ldots,n$ in land use category $i, i = 1,2,\ldots,q$ is a proportion of market value MV_{ij}.

Thus:

$$AV_{ij} = \Phi . MV_{ij} \qquad \begin{array}{l} i = 1,2,\ldots,q \\ j = 1,2,\ldots,n \end{array} \tag{3.12}$$

The legal requirement applicable to proportion Φ is such that $20\ \% \leq \Phi \leq 100\ \%$ while empirical findings have indicated that $4,3\ \% \leq \Phi \leq 86,3\ \%$.

Similarly, although the legal requirement applicable in South Africa in respect of the valuation of land is such that $\Phi = 100\ \%$, it is doubtful whether any local authority or valuator subscribes to this requirement.

Thus although legally required that:

$$AVL_{ij} = \Phi . MVL_{ij}; \qquad \Phi = 100\ \% \tag{3.13}$$

it is highly probable that in the majority if not all local authorities $0\% < \Phi < 100\%$ at time of valuation. On interurban as well as intra-urban comparison it would probably also be found that a variability exists in the value of Φ even if similar valuation dates were maintained.

3.2.2 Valuation of improvements

The basis of the valuation of buildings or improvements in Natal, the Orange Free State and the Cape is essentially the same. It is based on the cost approach to the valuation of buildings, less various forms of depreciation. In the Transvaal the basis of valuation is the difference between the market value of the property improved and the market value of the site.

In Natal section 155(6) of the Local Authorities Ordinance states that:

> "6(a) The value of buildings shall be the estimated cost of erection at the fixed date, and in determining that value the valuator shall take the estimated cost of erection at the fixed date and from it shall deduct an amount determined by him in respect of depreciation."

The prescriptions of section 155 (7)[3] are also applicable to the valuation of buildings, due cognizance being taken of the judgement of Mr A.J. Broome.[4]

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[3] Refer to p. 97
[4] Refer to p. 98

Excluded from the valuation of buildings are, in terms of section 152(1), any fence, wall, post, pier, gate, paving, roadway, path, fish pond, bird bath, fountain, pergola or other garden ornamentation as long as the aforementioned structures do not accede to any building. Not to be further included in the valuation of buildings are tennis courts, bridges, ramps, platforms or tram or railway lines or sidings, any tank or silo having a capacity of not more than 85 m^3, any embankment or terrace or any culvert or drain or any other structure used solely for the purpose of draining any land.

The aforementioned exclusions can, however, be taken into consideration by the valuator when determining the value of land. (Province of Natal, Local Authorities Ordinance No 25 of 1974, section 152(2)).

Plant and machinery are also not to be valued, provided that no tanks or silos other than tanks or silos in which any substantial part of any manufacturing process is constantly carried on shall be regarded as plant or machinery. (Province of Natal, Local Authorities Ordinance No 25 of 1974, section 152(3)).

In the Orange Free State the basis of the valuation of buildings is contained in section 106(1)(b) of the Local Government Ordinance:

> "(b) 'value of buildings' means the estimated cost of replacement of such buildings, at the time of such valuation, due allowance being made for any depreciation

either in the buildings themselves or in the marketable or rental value thereof ..."

Section 105(2) of the Local Government Ordinance states that: -

"'buildings' include any improvements which enhance the value of the property, but not any trees, shrubs or plants, or any terrace or paving for the purpose of a garden, on the property."

The foregoing is not to be included in the value of land either.

Section 44(1) of the Valuation Ordinance applicable in the Cape states that:

"44(1) Subject to the provisions of sub-section (2) the basis of valuation of buildings shall be the estimated cost of erection at the time of valuation, less such allowances as may be considered due on account of structural depreciation, obsolescence or a change in the nature of the locality since the erection of the building concerned."

Buildings and structures to be included as buildings are:-

"45(a) ....

(b) all buildings, including 'bungalows' and similar structures, of whatever material constructed, erected or in the course of erection;

(c) all loading platforms connected with private railway siding extensions;

(d) all railway sidings and siding extensions not used for farming or industrial purposes;

(e) all beneficial improvements;

(f) .....

(g) all lifts;

(h) all other structural improvements, ..."

(Province of the Cape, Valuation Ordinance No 26 of 1944, section 45).

In Natal, the Orange Free State and the Cape the assessed value of buildings and improvements AVI_{ij} erected on rateable fixed property $j, j = 1,2,\ldots,n$ in land use category $i, i = 1,2 \ldots, q$ is a proportion of the true estimated cost of erection or replacement of the improvements (AVR_{ij}). Owing to the tendency of valuers to invariably over- or under-assess the value of the various components of the cost of erection and replacement of buildings, the value of the various forms of depreciation and the value of exclusions we find that:

$$AVI_{ij} = \Phi_1 . AVR_{ij} - \Phi_i . AVD_{ij} - \Phi_i . AVE_{ij} \qquad (3.14)$$

where $\Phi_i . AVD_{ij} = \Phi_i . [AVPD_{ij} + AVFO_{ij} + AVEO_{ij}]$,

$\Phi_i . AVPD_{ij}$ = the proportion Φ_i of the true assessed value of the physical deterioration of the improvements,

$\Phi_i . AVFO_{ij}$ = the proportion Φ_i of the true assessed value of the functional obsolescence of the improvements,

$\Phi_i.AVEO_{ij}$ = the proportion Φ_i of the true assessed value of the economic obsolescence of the improvements, and

$\Phi_i.AVE_{ij}$ = the proportion Φ_i of the true assessed value of excluded improvements in terms of section 152(1) of Ordinance No 25 of 1974 (Natal), section 105(2) of Ordinance No. 8 of 1962 (Orange Free State) and section 45 of Ordinance No. 26 of 1944 (Cape).

As various improvements are not included in the estimated cost of erection or replacement equation and that the exclusions differ between Natal, the Orange Free State and the Cape, we find that:

$AVI_{NATAL} \neq AVI_{OFS} \neq AVI_{CAPE} \neq MVI$ where MVI equals the market value of improvements.

The basis of valuation of improvements in the Transvaal differs radically from that in the other three provinces:-

> "(c) the value of improvements ... shall be arrived at by subtracting the site value of land or the site value of a right in land from the improved value thereof." (Province of Transvaal, Local Authorities Rating Ordinance No 11 of 1977, section 9(1)(c).)

The site value of land, the site value of a right in land and the improved value of land equal the amount that would have been realised if the land or right in the land, improved land or the improved value of a right in land had been brought to sale in the open market and the contract had been closed between a willing seller and willing buyer. (Province of Transvaal, Local Authorities Rating Ordinance No 11 of 1977, section 9 (1)(a) and (b).)

In the Transvaal the assessed value of improvements AVI_{ij} of property $j, j = 1,2 \ldots, n$ in land use category $i, i = 1,2 \ldots, q$ is equal to the market value of the total property MV_{ij} (assuming that $\Phi_i = 100$ %) less the site value of land or the site value of a right in land MVL_{ij}.

Thus from the foregoing and equation (3.13):

$$AVI_{ij} = \Phi_i . MV_{ij} - \Phi_i . MVL_{ij} \qquad (3.15)$$

$$AVI_{ij} = \Phi_i . (MV_{ij} - MVL_{ij}) \qquad \begin{aligned} \Phi_i &= 0\% < \Phi \leq 100\ \% \\ i &= 1,2,\ldots,q \\ j &= 1,2,\ldots,n \end{aligned}$$

Depreciation of buildings is not defined in the ordinances applicable in Natal and the Orange Free State and only partially in the relevant valuation regulations of the Cape. Notwithstanding this, valuators as well as the courts have arrived at consensus as to the principal causes of depreciation. The causes are:-

1) Physical deterioration due to the erosion of the physical structure of the buildings. This erosion could be due to wear and tear through use, the action of the physical elements on the structure, and structural damage through neclect, fire, water, etc.

2) Functional obsolescence due to faulty design, inadequacy of structural facilities, superadequacy of structural facilities and outmoded equipment.

3) Economic obsolescence being the result of neighbourhood hazards and nuisances, changes in zoning and highest and best land use classification, downward changes in the sosio-economic status of surrounding areas, the over- or underimprovement of land and decreasing demand for fixed property in the surrounding area (Ring, pp. 186 - 187).

3.2.3 Date of valuation and valuation cycles

In Natal and the Transvaal dates have to be determined by the councils of local authorities prior to a general valuation of fixed property being undertaken in a specific local authority. All valuations and interim valuations are to be related to these dates.

In Natal this date is known as the fixed date and this date is not to be earlier than the date of determination by council nor later than the date of commencement of the general valuation of fixed property. All valuations (general and interim valuations) must be related to the fixed date (section 155 (1)(c) of the Local Authorities Ordinance, 1974). General valuations are to be undertaken as often as deemed necessary by local authority councils but not less than once in every period of five years (section 155(1)(a) of the Local Authorities Ordinance, 1974).

A similar date is determined by councils of local authorities in the Transvaal but is known as the date of valuation.

In terms of section 6(2) of the Local Authorities Rating Ordinance:

> "(2) A local authority shall, for the purposes of a general valuation, fix a date (to be known as the date of valuation) which shall be not more than six months prior to that first day of July which is the date on which the validity of the general valuation, as contemplated in subsection (1), shall commence and such valuation shall reflect the value of all rateable property as at the date of valuation."

All general valuations and interim valuations undertaken during the period of validity of a general valuation roll must be related to the date of valuation.

General valuations in the Transvaal are to be undertaken at a maximum interval of four years but if exceptional circumstances necessitate it, this period may be extended by the Administrator but for not more than one financial year at a time (section 6(1) of the Local Authorities Rating Ordinance, 1977).

In the Cape the valuation date, referred to as the time of valuation, to which all general valuations and interim valuations are to be related is determined by the Director of Valuations.

In section 2 of the Valuation Ordinance, 1944 it is stated that:

"'time of valuation' means: -

(a) in the case of a general valuation a date prescribed by the Director by notice in the Provincial Gazette before or during such valuation; provided that the Director may amend such date from time to time; provided further that, where no such date has been prescribed for the purposes of applying paragraph (b), the Director may prescribe a date in respect of valuations that have been completed,

(b) in the case of an interim valuation, the time of valuation prescribed by the Director in respect of the immediately preceding valuation of the local authority area in which the immovable property to be valued is situated."

General valuations are to be undertaken whenever the Administrator so directs but at least once in a five-year interval, the first such period to be reckoned from the 1st of January, 1961 (section 39(1) of the Valuation Ordinance, 1944). In lieu of making a general valuation the Administrator may direct that the existing valuation roll in force be revised to take account of changing values and circumstances. The revised valuation roll shall then for all purposes be deemed to be a general valuation roll (sections 139(1) and (2) of the Valuation Ordinance, 1944).

The legislature of the Orange Free State has made no provision for the determination of a common date to which general and interim valuations are to be related. In respect of the valuation of buildings it is, however, stated that the valuations are to be as at the time of valuation (section 106(1)(b) of the Local Government Ordinance, 1962). No date is mentioned in respect of the valuation of land. A general valuation of all immovable property within a local authority is to be undertaken at least once during a cycle of five years (section 101(1)(a) of the Local Government Ordinance, 1962).

3.3 Conclusion

The role played by the various valuation agencies, valuators permanently employed by local authorities and independent valuators undertaking valuations for municipal tax purposes is not only of extreme importance in the determination of municipal valuations per sé, but also in the distribution and amount of taxes paid by the various inhabitants of local authority areas. Thus, although the randage applicable in a specific area is the result of politicial decisions made by the elected political representatives serving on local administrative and political bodies, the distribution and amount of these taxes across the judicial areas of these local administrative and political bodies, are the direct result of the valuator's opinion of the value of rateable fixed property.

Whether this distribution and the amount of tax payable by individual inhabitants are equitable, is solely dependent on the valuator's ability to fix "correct" values in respect of the various individual properties.

CHAPTER 4

PROPERTY VALUATIONS: ADMINISTRATIVE QUALITY

The criticism most commonly directed at the property tax as a source of income available to local authorities is in respect of the administration and execution of the valuation function. According to Netzer (1974) the achilles' heel of the property tax is the bad administration of the tax (p. 193) with the resultant inequitable distribution of valuations and taxes.

4.1 Valuation equity

"An axiom of equitable property-tax assessments is that all properties of similar land use and market value are to be valued equally for tax assessments; this is an axiom of equal valuation of equals" (Thrall, 1979 [b], p. 278).

Equity in urban valuations is achieved when, if the assessed value is based on the market value of fixed property, the ratio

$$\Phi_i = \frac{AV_{ij}}{MV_{ij}} \qquad \text{or,}$$

if the assessed value is based on the market value of land and the replacement cost of improvements less depreciation, the ratio

$$\Phi_i = \frac{AVL_{ij}}{MVL_{ij}} + \frac{AVI_{ij}}{AVR_{ij} - AVD_{ij} - AVE_{ij}}$$

(from equations 3.13 and 3.14) for all properties, irrespective of their land use or land use zoning and market value, is constant throughout a taxing surface. The ratio Φ_i can take the value $0\ \% < \Phi_i \leq 100\ \% + \infty$ but as long as a constant Φ_i is maintained, valuation equity is achieved. Thus according to Paglin and Fogarty's (1972) definition of perfect equity: "If the ratios of assessed values to market values for all properties were equal, no matter what the specific value of the ratio, then there would be no horizontal or vertical inequity within any political jurisdiction having a uniform tax rate" (p. 557).

4.2 Valuation inequity

Variations in the ratio Φ throughout a valuation or taxing district may be the result of two types of valuation errors.

Firstly, valuation errors may be primarily random and nonsystematic. This type of error is referred to by Reinmuth (1976[a]) as market error (p. 104) and is the result of price randomness that exists in any competetive free market on which nonhomogeneous commodities are brought to sale by heterogeneous sellers for purchase by heterogeneous buyers. Market error is depicted by the variation between the selling price of fixed property and the free market value of the property. The market value of a group of similar properties may be R50 000 but the selling prices of the properties will seldomly be equal to R50 000 or equal to one another. What will be found is a range of selling prices grouped around the R50 000 market value. Fixed property thus has a range of selling prices rather than a unique selling price and consequently does not have a unique assessed value or market value. (Schroeder et al., 1976, p. 223).

The second type of valuation error is a systematic controllable error which is the result of the poor administration and execution of the valuation function. This type of error reflects a systematic price-related difference between assessed values and market values and can be referred to as assessment or valuation inequity (Reinmuth, 1976[a], p.104). A logical consequence of valuation inequity is invariably property tax inequity.

Valuation inequities can be of two types: Horizontal valuation inequity and vertical valuation inequity.

Horizontal valuation inequity follows when properties in various land use categories display a large variation in valuation ratios or when properties in similar land use categories with similar characteristics and market values also have a large variance in valuations or valuation ratios (Downing et al., p. 17; Paglin et al., 1972, p. 559). Horizontal equity is based on the simple perception that people (property owners) who are in similar circumstances should bear similar burdens. If this assumption is violated, inequity follows (Blum et al., p. 145).

Vertical valuation and tax inequities result when properties in similar land use categories but different value classes are valued differently for the various value classes and display a variation in the valuation ratio Φ_i for the various value classes (Downing et al., p. 18).

4.3 Reasons for valuation inequity

Numerous researchers have, as a result of empirical research and by way of methodological discussion, identified several reasons for the poor administration and execution of the valuation function that has given rise to the incidence of intrajurisdictional nonuniformity in the ratio of assessed values to market values. The various reasons can be typified as follows:

4.3.1 Valuers tend to underassess high-value residential properties and overassess low-value and older residential properties relative to their market values owing to the lack of sales and consequential lack of market indicators in respect of these types of properties. Average, standard housing is more numerous and its value is easily determined in terms of market value, square meterage, number of bathrooms and other characteristics.

High-value residential properties tend to exhibit individualised design characteristics and possess luxury and cosmetic accessories which affect the resale value of the properties but the effect of which is omitted or not fully taken into consideration when determining the assessment of such high-value residential properties.

The overassessment of older residential properties may also be due to, over and above the lack of sales, the application of an incorrect depreciation factor or the lack of knowledge of the depreciation of older homes (Smith, T.R., 1972, p. 26; Downing et al., p. 20; Schroeder et al., 1975, p. 233; Paglin et al., 1972, p. 559; Thrall, 1979 [b], p. 280).

4.3.2 In order to avoid conflict and reprisals through appeals, refusals to renew contracts or the occurrence of impaired employment prospects, valuers tend to underassess residential properties situated in high sosio-economic status neighbourhoods, thereby appeasing politically active and articulate home-owners (Smith, T.R., 1972, p. 26; Pomp, p. 109fn; Thrall, 1979 [b], p. 280).

4.3.3 In an inflationary or dynamic residential property market that is characterised by a differentially changing value profile over time and across space, the failure to comprehensively adjust assessments regularly, leads to valuation inequities. This lag in the frequent revaluation or adjustment of assessments accounts for a substantial proportion of the variation in assessment ratios perceived in various communities. The more inflationary or dynamic the property market and the longer the period between revaluations, the greater will the variation in assessment ratios tend to be.

The lag in updating assessments to keep them in line with price movements as determined by the market can result in the overassessment of blighted, low-priced, marginal and deteriorating properties that exhibit a decrease in value or a less rapid increase in value than properties situated in more desirable areas.

The values of properties situated in more affluent areas will increase at a higher rate than those situated in areas affected by negative internalities and externalities. These unaffected properties will exhibit lower assessment ratios and the ratios will continue to decrease with the passage of time until the next comprehensive revaluation (Smith, T.R., 1972, p. 26; Downing et al., p. 18; Schroeder et al., 1975, p. 45; Schroeder et al., 1976, p. 222; Plattner, pp. 20 and 21; Paglin et al., 1972, p. 560; Pomp, p. 116fn; Engle, p. 449; Oldman et al., 1965, p. 43; Berry et al., 1975, p. 38; Thrall, 1981, p. 450).

The various provincial ordinances regulating the period between the general revaluation of all fixed property within the jurisdictional areas of local authorities and the application of these regulations to satisfy the minimum requirements, mostly due to budget constraints, implicitly contribute to valuation inequities resulting from the lack of regular updating of assessments and the consequential lag phenonema. The maximum interval at which general revaluations are to be undertaken is five years in Natal, the Orange Free State and the Cape. A four-year period is applicable in the Transvaal. Extension of this maximum interval can, however, be granted on application by the relevant authority.[1]

4.3.4 Valuers exhibit a subjective bias in favour of or against certain groups. This bias against certain groups results in the relative overassessment of their properties or conversely the relative underassessment of the properties of the groups that the valuer favours. Empirical studies have found that patterns of

[1] Refer to pp. 111, 112, and 113 for the necessary references and more complete exposition.

overassessment exist in areas characterised by high densities, low income, relatively small housing or a large proportion of the neighbourhood inhabitants being recent immigrants or non-Whites (Schroeder et al., 1976, p. 223; Botha, 1970, p. 85; Berry et al., 1975, p. 38; Black, pp. 205 and 207; Thrall, 1979 [b], p. 281).

4.3.5 Variations in the ratio of assessments to market values may be the result of the inability of valuers, through incompetence, to predict residential property values correctly, the low quality of the valuation procedure used or an actual error in the valuation process employed. The resulting valuation errors would be of a nonsystematic and random nature and would be generally distributed through value and land use classes as well as spatial areas (Schroeder et al., 1975, p. 45; Schroeder et al., 1976, p. 222; Plattner, p. 21).

4.3.6 The overassessment of low-value residential properties can be the result of the subjective application by the valuer of the benefit principle, the rationale being that inhabitants of low-value properties or properties situated in less desirable areas do not receive proportionally fewer benefits than do residents of higher value residential properties. The tax contribution of all residents should thus be equal. To attain this, low-value residential properties are overassessed relative to the assessments of residential properties at the higher end of the value range (Engle, p. 445; Oldman et al., 1965, p. 45).

4.3.7 In Natal and the Orange Free State prescriptive statutory regulations and legislation controlling the basis of valuation on which property tax liability is based, lead to valuation inequity. The relative legislation determines that certain types of structures and improvements to land are to be excluded when determining the valuation of land and buildings, notwithstanding the fact that these improvements to land and structures contribute significantly to the market value of residential properties.

The structures and improvements to land not to be included in the determination of the valuation of land or buildings are in the case of residential properties basically of a non-essential luxury and cosmetic nature and are especially characteristic of high-value residential properties.

In the Orange Free State no improvements to the land, trees, shrubs or plants, terraces and paving for the purpose of a garden are to be considered in determining the valuation of fixed property (Province of the Orange Free State, Local Government Ordinance No 8 of 1962, section 105 (2)).

In Natal the value of a fence, wall, post, pier, gate, paving, roadway, path, fish pond, bird bath, fountain, pergola or any other garden ornamentation, tennis court, bridge, ramp, embankment, terrace, culvert or drain or other structures used solely for the purpose of draining any land is not to be included in the valuation of fixed property (Province of Natal, Local Authorities Ordinance No 25 of 1974, section 152 (1)).

Owners and occupants of low-value residential properties usually do not possess the financial resources for the erection and construction of these non-essential, principally luxury and cosmetic structures and improvements to land. Further, if these structures should be erected or improvements to land should be undertaken on low-value residential properties, they would usually not be of the same extent and quality as those erected on high-value residential properties. Their contribution to the market value of low-value residential properties would thus accordingly be considerably less than for high-value residential properties.

By excluding these non-essential structures and improvements to land from valuations, the valuations of low-value residential properties will exhibit a smaller difference between assessed value and market value than would the valuations of high-value residential properties. The market value of high-value residential properties is increased by the presence of these structures and improvements to land, but their valuations are not.

Inequity in valuation and taxation in favour of high-value residential properties results because a relatively larger proportion of the capital investment of owners of low-value residential properties is subject to taxation than is the case with the capital investment of owners of high-value residential properties.

4.3.8 The lack of legislative provisions in the Orange Free State for the determination of a date to which land valuations (general and interim) are to be related as well as the provision that building valuations be as at the time of valuation, will obviously lead to valuation inequity.

In the absence of a valuation date valuators can use their discretion as to which date to relate land valuations to. If the general valuation of land should extend over a protracted period in a changing (declining or rising) property market, comparable sales at various dates could, as the work proceeds, be used as the basis of valuation for different intra-urban areas. If interim valuations should be undertaken during the five-year period between general valuations, the valuator could use recent comparable sales as his criterion for valuation. Fixed property in respect of which an interim land valuation is undertaken would be affected negatively in a market with rising prices and positively in a market exhibiting declining prices.

A similar situation exists in respect of building valuations. Since replacement costs of the building at the time of valuation are to be used as basis of valuation, any new building for which an interim valuation is issued, would in a declining-costs situation be favourably affected while in a rising-costs situation the newer building would be adversely affected in respect of valuations and ultimately in tax liability.

4.4 Consequences of valuation inequity

Systematic intrajurisdictional valuation inequity and resulting property tax inequities can have far-reaching consequences.

4.4.1 Vertical valuation inequity where the valuator exhibits a bias in favour of high-value residential properties accentuates the regressivity of the property tax. It leads to the shifting of the tax burden to those who can ill afford it. The tax becomes regressive in respect of personal income and the poorer tax payer is generally worse off after taxation than before, relative to his richer counterpart (Paglin et al., 1972, p. 558). This situation can of course be reversed if the valuator should exhibit a valuation bias in favour of lower value residential properties. Progressive taxation would then result. The ideal the valuator should strive for is a neutral valuation bias and any regressive or progressive taxation bias should be the result of political decisions by the local political representatives and not the result of the actions of the valuator.

4.4.2 Horizontal valuation inequity leads to the violation of the axiom of equal treatment of equals. This usually gives rise to the shifting of the tax burden from one land use category to another or from one neighbourhood to another, notwithstanding the fact that the neighbourhoods have similar characteristics, market values and are occupied by similar land uses.

4.4.3 Vertical and horizontal valuation bias can contribute significantly to neighbourhood blight. Low-value properties generally generate negative or marginally positive cash flows. With an inequitable increase in the valuation differential between low- and high-value properties due to the relative overvaluation of low-value properties, the possibility of low-value properties generating a positive cash flow would be substantially destroyed. This in turn is reflected in reduced expenditure on maintenance, repairs and the upgrading of low-value properties (Peterson et al., p. 120; Berry et al., 1975, p. 24).

4.4.4 The negative or marginally positive cash flows generated by low-value properties would be further exacerbated by the relative overvaluation of these properties. This can lead to the collapse of the low-value housing market as, under these circumstances, the market value of these properties would approach zero. Owners who would wish to sell their holdings, would then be unable to find purchasers (Peterson et al., p. 120).

4.4.5 A spatially invariate valuation ratio can contribute to restricting the locational choices available to prospective investors in fixed property. It thus distorts the availability of economic alternatives and inhibits economic development. It can also lead to a centrifugal movement of economic functions from high- to low-tax areas with a resultant lowering of land use intensities in higher taxed areas (Berry et al., 1975, p. 24). A case in point is the dispersal of economic activities from the central city to outlying areas. Although it is doubtful that the relatively high valuations and consequent high tax rates experienced in central city areas have been major contributors to the economic decentralisation of these areas, the current valuation and tax differentials in favour of outlying areas most probably have convinced some businesses and residents, who otherwise might have preferred a central city location, to choose instead a location in an outlying area (Netzer, 1966, p. 123).

4.4.6 Valuation inequity destroys the taxpayer's confidence in the property tax as a reliable and just source of income available to local government. It thereby undermines the financial foundation of local government (Geraci et al., p. 235) and is a major contributing factor in justifying calls for the abolition of the property tax.

4.5 Conclusion

In order to maintain the acceptability of the property tax as a source of income for local government, it is necessary that the property tax as well as the basis of the property tax - the valuation procedure - should be administered at a very high level of efficiency. This can be done by improving the execution of the valuation task function through the application of improved valuation techniques, thus improving the proficiency of the valuator.

In the following sections of this study, the development of an improved multivariate statistical model of the price of housing, which can be applied to determine bias-free valuations of single-family housing, will be pursued.

CHAPTER 5

STUDY AREA AND SAMPLING PROCEDURE

5.1 Study Area

The study focuses on aspects of the market value, price and municipal value of single and semi-detached houses situated within the municipal area of Bloemfontein and two suburbs of Bainsvlei: Langenhoven Park and Langenhoven Park Extension 1. The study is further restricted to those properties with the following usage zonings: In Bloemfontein: "Special Single Dwelling Residential" and "Single Dwelling Residential" and in Langenhoven Park[1] : "Special (Single) Residential Erven."

Data to undertake the research were collected in respect of properties sold and transferred from 1 January 1983 to 31 March 1984.

On 29 June 1983, which falls within the research and sales period, the Bloemfontein Town Planning Scheme and the Conditions of Establishment of Langenhoven Park stipulated that the aforementioned properties could automatically, without obtaining the approval of the local authority, be used solely for residential purposes, the erection of only one dwelling plus the normal outbuildings being allowed on the property.

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[1] In the rest of the dissertation Langenhoven Park refers to Langenhoven Park and Langenhoven Park Extension 1 unless otherwise indicated.

With the prior approval of the local authority, structures or installations required for municipal purposes may be erected on properties zoned "Special Dwelling Residential". On properties zoned "Single Dwelling Residential" the prior approval of the local authority can be obtained to erect structures or installations required for municipal purposes; town houses; semi-detached houses; places of instruction which include schools, colleges, technical institutes, lecture halls and other academic institutions, convents, public libraries, art galleries, museums and gimnasiums; places of assembly which include public halls, movie theatres, theatres, concert and dance halls, exhibition halls, race tracks, sport or amusement centres which charge attendance fees, clubs (non-residential) and buildings for public gathering; institutions which include churches and the attending buildings for social association and recreation, public and charitable institutions. Nursery schools, homes for the aged or buildings used by charitable institutions may be erected on properties zoned "Special (Single) Residential Erven (Bloemfontein Town Planning Scheme, No 1 of 1954; Administrator's Proclamation 230 of 1981 and Administrator's Proclamation 245 of 1982).

To determine the number, spatial location and spatial distribution of the potential participant units in the housing market being researched, a land use survey of the study area was undertaken from 1 April 1984 to 10 April 1984.

An exposition of the number of completed single and semi-detached houses situated on properties in the three usage zones is given in table 5.1.

Table 5.1 NUMBER OF COMPLETED HOUSES SITUATED ON PROPERTIES ZONED "SPECIAL SINGLE DWELLING RESIDENTIAL", "SINGLE DWELLING RESIDENTIAL" AND "SPECIAL (SINGLE) RESIDENTIAL ERVEN": 10 APRIL 1984

Zoning	Single houses	Percentage	Semi-detached houses	Percentage	Total houses	Percentage
Special Single Dwelling Residential	12164	80,29	76	21,11	12 240	78,91
Single Dwelling Residential	2 690	17,75	284	78,89	2 974	19,17
Special (Single) Residential Erven	297	1,96	-	-	297	1,92
Total	15 151	100,00	360	100,00	15 511	100,00

It would appear that 76 semi-detached houses are situated, at variance with the provisions of the town planning scheme, on "Special Single Dwelling Residential" properties. These houses were, however, constructed prior to 1950 and thus prior to the commencement of the town planning scheme.

A total of 15 511 single and semi-detached houses formed the potential elements in the housing market. Of these, a very small percentage (< 2,00 %) were situated in Langenhoven Park while more than three quarters of all houses were situated on properties zoned "Special Single Dwelling Residential" and approximately 20 % (19,17 %) were situated on properties zoned "Single Dwelling Residential."

5.2 Sample stratification

To ensure the meaningful interpretation of implicit house price estimates and to select a representative and unbiased sample of owner-occupied single and semi-detached housing units, the study area was spatially disaggregated or segmented into internally homogeneous socio-geographic zones in terms of the socio-economic status of households, the life cycle of households, housing tenure and housing characteristics. The homogeneous socio-geographic zones served as stratification basis for sample selection.

To effect the geographical disaggregation of the study area, data in respect of 967 respondent households occupying rented and owner-occupied single and semi-detached housing units surveyed during the first half of 1983 were kindly supplied by Prof. W.F.S. Senekal, Department of Geography, University of the Orange Free State. The data were collected for a research project undertaken for the Institute of Social and Economic Research, U.O.F.S., to construct a housing supply model for Bloemfontein. The research project was jointly funded by the Central Research Fund (Sentrale Navorsingsfonds), U.O.F.S., and the Human Sciences Research Council, Pretoria.

22 representative variables extracted from an extended data matrix were employed in the segmentation of the study area. These variables are set out in table 5.2.

Initial analysis of the data through the application of BMDP1D revealed that 11 cases displayed missing values in respect of various variables. As it was not possible to estimate the missing values and the cases constituted a small proportion (1,14 %) of the total sample, these cases were deleted from the analysis.

Table 5.2 VARIABLES USED IN HOUSE MARKET SEGMENTATION

Group	No.	Code	Variable
Socio-economic status	1	INCOME	Annual income of household
	2	PROF	Occupation of household head professional
	3	WHITEC	Occupation of household head white collar
	4	BLUEC	Occupation of household head blue collar
	5	NONLAB	Head of household retired or unemployed
	6	EDUC	Education level of household head
Life cycle	7	AGE	Age of head of household
	8	A	% of household members ≤ 5 years
	9	B	% of household members ≥ 6 years ≤ 18 years
	10	C	% of household members ≥ 19 years ≤ 64 years
	11	D	% of household members ≥ 65 years
	12	PER2	≤ 2 person household
	13	PER3	3 - 5 person household
	14	PER6	≥ 6 person household
	15	MOTHER	Mother in labour market
Tenure	16	OWNER	Owner-occupied housing
	17	RENTED	Rented housing
Housing characteristics	18	SINGLE	Single housing
	19	ROW	Double housing
	20	BATH1	Single bathroom housing
	21	BATH2	≥ 2 bathroom housing
	22	ROOM6	≥ 6 rooms per house

To detect univariate outliers the mean of the dichotomous and discrete variables and the Z-scores of cases on the continuous variables were calculated. Table 5.3 reflects the necessary information. As the dichotomous and discrete variables were measured on the binary scale yes = 100 and no = 0, the means of these variables reflect the percentage division between the various categories. The variables A, B, C and D (age categories) were recorded as percentage of the household in a specific age group. The means of these variables thus also indicate the percentage division of the household members of the total sample into the 4 age groups.

Table 5.3 MEANS OF DICHOTOMOUS AND DISCRETE VARIABLES AND Z-SCORES OF CONTINUOUS VARIABLES (956 RESPONDENTS)

Variable	No.	Mean	Smallest z-score	Largest z-score
INCOME	1	R19 597,55	-1,71188	3,34878
EDUC	6	11,98 years	-1,83464	3,31852
AGE	7	45,28 years	-2,01324	3,50284
PROF	2	21,34 %		
WHITEC	3	43,41 %		
BLUEC	4	22,91 %		
NONLAB	5	12,34 %		
A	8	8,46 %		
B	9	22,59 %		
C	10	62,34 %		
D	11	6,61 %		
PER2	12	25,63 %		
PER3	13	66,21 %		
PER6	14	8,16 %		
MOTHER	15	35,57 %		
OWNER	16	83,47 %		
RENTED	17	16,53 %		
SINGLE	18	97,39 %		
ROW	19	2,61 %		
BATH1	20	51,88 %		
BATH2	21	48,12 %		
ROOM6	22	50,63 %		
SINCOME	23	134,98	-2,59067	2,67941
LEDUC	24	1,068	-2,37416	2,70246
LAGE	25	1,638	-2,82964	2,53334

Table 5.4 TEST STATISTIC OF TRANSFORMED VARIABLES

Transformed variable	Test statistic	At level P ≤ 0,01
SINCOME	3,2680755	-2,58 < z > 2,58
LINCOME	-9,0951660	-2,58 > z < 2,58
SEDUC	8,3293178	-2,58 < z > 2,58
LEDUC	3,6301865	-2,58 < z > 2,58
SAGE	2,1095729	-2,58 < z < 2,58
LAGE	-1,5717788	-2,58 < z < 2,58

Tabachnick and Fidell state that dichotomous variables with an uneven split (90 % - 10 %) between categories may give rise to outliers. The correlation coefficients between these variables and other variables may be truncated while the scores of the variable with the lower percentage division are more influential in correlations than those of the variable with the higher percentage division. On the authority of Rummel they suggest the deletion of dichotomous variables with very uneven splits between categories. (p. 74). The dichotomous variables SINGLE and ROW with an uneven split of 97,4 % - 2,6 % were accordingly deleted from further analyses.

Various cases reflected very deviant standardised scores on the continuous variables. 16 cases had z-scores > + 3,00 in respect of the variable INCOME, while 28 cases and 4 cases had z-scores > + 3,00 in respect of the variables EDUC and AGE respectively. Rather than deleting these outliers, transformations were performed on the data to move the extreme scores closer to the central tendency of the distribution (the data transformations are discussed in detail in the next paragraph).

Evaluating the assumption of normality, the continuous variables were inspected through SPSS Condescriptive. It was found that, at level $P \leq 0{,}01$, all three variables revealed positive skewness. To evaluate the skewness of the variables, the test statistic $z = \frac{S-O}{s_S}$ (where S is the value of the reported skewness and $s_S = \sqrt{\frac{6}{N}}$) was employed. In respect of INCOME $z = 13{,}3784972$, EDUC $z = 13{,}3826618$ and AGE $z = 8{,}3293178$. As all three variables reflected a test statistic $z > z_{0,005} = 2{,}58$ the assumption of normality had to be rejected. Square root and logarithmic transformations were performed on all three variables to reduce skewness as well as to reduce the influence of univariate outliers. The square root and logarithmic transformations of INCOME are SINCOME and LINCOME respectively, that of EDUC, SEDUC and LEDUC respectively and of AGE, SAGE and LAGE respectively. The test statistic of the transformed variables is set out in table 5.4.

SINCOME, SEDUC and LEDUC, at level P = 0,01, revealed significant positive skewness and LINCOME significant negative skewness. The skewness of SAGE and LAGE did not differ significantly from zero. As the skewness of SINCOME, LEDUC and LAGE reflected the smallest measure of skewness, it was decided to perform and incorporate a square root transformation on INCOME and logarithmic transformations on EDUC and AGE in the analyses.

Owing to the size of the sample it was felt that the moderate skewness of SINCOME and LEDUC could be accommodated without making a realistic difference in any further analyses while the use of the transformed variables would markedly enhance structural analysis. Through the incorporation of SINCOME, LEDUC and LAGE the impact of univariate outliers was reduced, since no case revealed z-scores in excess of ± 3,00. Refer to table 5.3.

The retained dichotomous and discrete variables, except for OWNER and RENTED, did not reveal skewness since in none of the variable groups did more than 80 % to 90 % of the cases fall into one category (Tabachnick, et al., p. 78). Notwithstanding the skewness present in OWNER and RENTED, the variables were retained in further analyses.

Principal component factor analysis without rotation, employing BMDP4M, was performed on 956 cases and 20 variables to estimate the presence of multivariate outliers among cases, outliers among variables, absence of multicollinearity and singularity and factorability of the correlation matrix. A second and final factor analysis, again extracting the factors by principal components, was used to identify cases that did not fit the solution very well, while the factor scores of the retained cases on the retained factors were further analysed to segment the study area.

To determine multivariate outliers among cases the Mahalanobis distances, evaluated as χ^2's of each case from the centroid of the cases for the original data, were scrutinised. With 15 df (the number of factors with eigenvalues < 0,000) the critical χ^2 value at α = 0,01 is 30,5779. As χ^2 has been divided by the degrees of freedom in the BMDP4M output, any value in excess of 2,039 indicates outliers. Using this criterion, 18 cases were detected as multivariate outliers and deleted from subsequent analyses.

Inspection of the correlation matrix between the 20 variables revealed 2 correlations with values = -1,000. The unity correlations were between OWNER and RENTED and BATH1 and BATH2. The correlation matrix was thus singular. The squared multiple correlations between variables and the eigenvalues associated with some of the factors were = 0,000. This indicated that multicollinearity and singularity were present in the data set. Five offending variables were deleted to eliminate multicollinearity and singularity. The offending variables were BLUEC, B, PER3, RENTED and BATH2.

Subsequent factor analysis confirmed that with the deletion of the offending variables singularity and multicollinearity had been removed. On the second run the highest squared multiple correlation between variables was 0,73540, the lowest eigenvalue was 0,1341 and the highest correlation between variables was 0,6310 (NONLAB and D).

Inspection of the initial and subsequent correlation matrices among variables revealed numerous correlations in excess of ± 0,30 and some considerably higher. Patterns in responses to variables were therefore anticipated.

The squared multiple correlations between variables, eigenvalues and squared multiple correlations of the variables with the factors for the initial as well as the final run are set out in table 5.5.

On the final principal component factor analysis run no outliers among variables were identified as the lowest squared multiple correlations among variables were 0,11919 (OWNER) and 0,14327 (PER6), neither being dangerously close to zero.

The number of factors to be retained in further analyses were identified through the application of Cattel's Scree Test. The Scree Test entails plotting the variance explained by each factor in the order of extraction and then retaining the number of factors prior to the elbow in the curve (Green, p. 365).

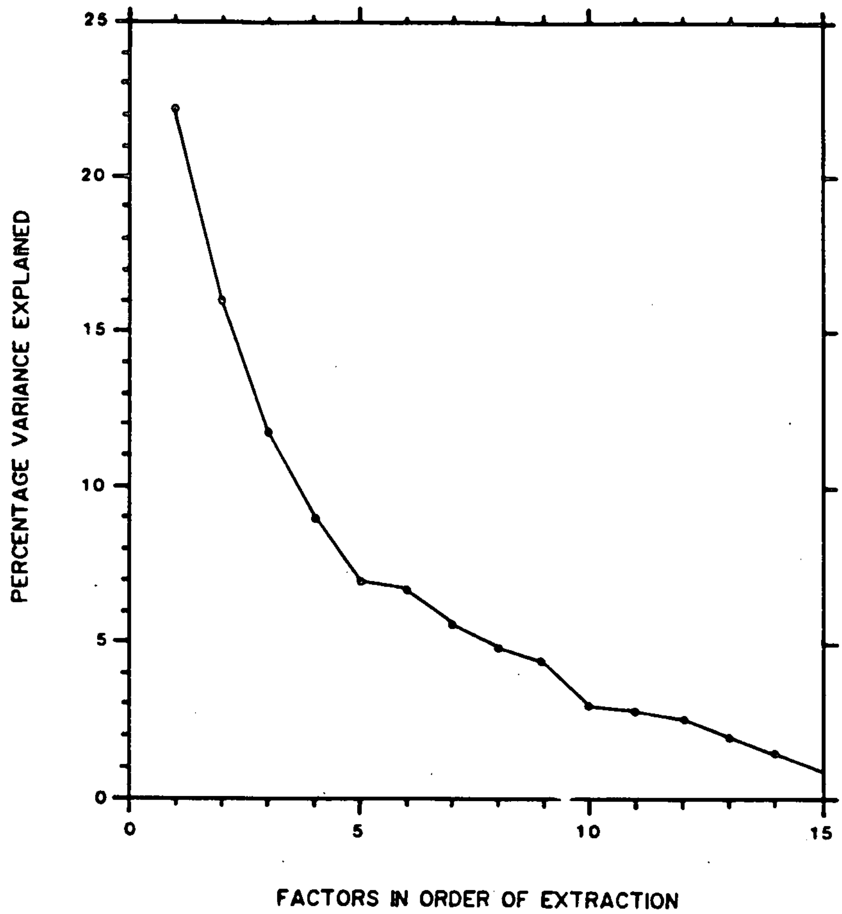

DIAGRAM 5.1 CATTEL'S SCREE TEST

Diagram 5.1 indicates that 4 factors explaining 58,78 % of the total variance should be retained for further analysis.

28 cases that did not fit the solution very well were identified and deleted from further analyses. At $\alpha = 0,01$ with 4 df (the number of factors retained) the significant value is $\chi^2/df = 3,319$ (13,2767/4). Cases with Mahalanobis distances of each case from the centroid of the factor scores, evaluated as χ^2/df, which were larger than 3,319, were evaluated as deviant cases in the space of the solution.

The initial 967 respondents were thus reduced to 910 respondents which were retained for further analysis. 11 cases were deleted because they had missing values which could not be estimated. Thereafter 18 cases were detected as multivariate outliers among cases and deleted, while 28 cases which did not fit the factor solution very well, were also deleted.

5.2.1 Factor interpretation

Factor 1: The first factor with an eigenvalue of 3,3180 explains 22,12 % of the total variance between factors. This factor is without doubt an indication of low socio-economic status with households in the later life-cycle stage. Cases with high positive factor scores in respect of this factor are

Table 5.5 SMC'S BETWEEN VARIABLES, SMC'S WITH THE FACTORS AND EIGENVALUES: INITIAL AND FINAL FACTOR ANALYSIS

	SMC between variables		SMC with factors			Eigenvalues	
Variables	Initial analysis	Final analysis	Initial analysis	Final analysis	Factor	Initial analysis	Final analysis
PROF	0,57193	0,57404	0,8510	0,8295	1	3,9790	3,3180
WHITEC	0,44683	0,43991	0,9792	0,7759	2	3,2157	2,3960
BLUEC	1,00000	-	0,9029	-	3	1,9698	1,7458
NONLAB	0,55525	0,57995	0,6942	0,7200	4	1,8264	1,3567
A	0,42354	0,43984	0,9164	0,7736	5	1,6612	1,0627
B	1,00000	-	0,8852	-	6	1,3752	1,0051
C	0,66322	0,65269	0,9097	0,8556	7	1,2641	0,8424
D	0,74932	0,73540	0,7949	0,8176	8	1,1276	0,7305
PER2	0,54429	0,55728	0,8565	0,6050	9	0,9659	0,6480
PER3	1,00000	-	0,9785	-	10	0,5846	0,4526
PER6	0,13896	0,14327	0,8620	0,7326	11	0,5709	0,4179
OWNER	0,11849	0,11914	0,9773	0,4639	12	0,4744	0,3697
RENTED	1,00000	-	0,9773	-	13	0,4450	0,2992
BATH1	0,39310	0,39955	0,9404	0,6804	14	0,3407	0,2213
BATH2	1,00000	-	0,9404	-	15	0,1994	0,1341
ROOM6	0,40750	0,41673	0,5899	0,6940	16	0,0000	-
MOTHER	0,19405	0,19835	0,2708	0,7939	17	0,0000	-
SINCOME	0,45873	0,48070	0,5889	0,7016	18	0,0000	-
LEDUC	0,47928	0,49038	0,7213	0,6537	19	0,0000	-
LAGE	0,61297	0,62345	0,7822	0,7870	20	0,0000	-

characterised by the heads of the households being unemployed or retired (NONLAB, loading, 0,701), with low incomes (SINCOME, loading - 0,691), the households consisting mainly of older members (D, loading 0,659), the household heads older than 65 (LAGE, loading 0,591), living in smaller homes (BATH1, loading 0,550; ROOM6, loading -0,516) and their children having left the family (PER2, loading 0,463).

Cases with high negative scores on this factor are typified by professionals with higher levels of education, high incomes, living in large homes, in the early child-raising stage of the family life cycle and with mothers having to work to maintain their life style (LAGE, loading 0,591; PROF, loading -0,486; LEDUC, loading -0,548; SINCOME, loading -0,691; ROOM6, loading -0,516; BATH1, loading 0,550; A, loading -0,334; MOTHER, loading -0,304).

Factor 2: This factor with an eigenvalue of 2,3960 explains 15,97 % of the total variance between factors. This factor is an indication of **middle-high socio-economic status coupled with households in the later stage of the family life cycle.** Cases with high positive scores on this factor are characterised by highly educated retired people or professionals in the later stage of the family life cycle whose children have left the family (NONLAB, loading 0,384; PROF, loading 0,463; LAGE, loading 0,552; PER2, loading 0,440; LEDUC, loading 0,529 and D, loading 0,330). The houses occupied are large (it could thus be assumed that the housing is older than the average and is mainly owner-occupied (ROOM6, loading 0,479; OWNER, loading 0,397). The households have reasonably high incomes (SINCOME, loading 0,329).

Cases with high negative scores on this factor are households in the early child-raising stage of the family life cycle, they live in smaller houses and the head of the household is employed in a white-collar occupation (A, loading -0,468; BATH1, loading -0,414; WHITEC, loading -0,353).

Factor 3: This factor with an eigenvalue of 1,7458 explains 11,64 % of the total variance between factors. Factor 3 is an indication of **family life-cycle status**. Cases with high scores on this factor are childless, in the age group 19 - 64 years and employed in white-collar occupations. These households are young families in the pre-child stage of the family life cycle most probably occupying rented housing (C, loading 0,784 against A, loading -0,443 and D, loading -0,396; PER2, loading 0,353 and OWNER, loading 0,099). The head of the household is employed in a white-collar occupation (WHITEC, loading 0,538 against PROF, loading -0,338).

Factor 4: This factor with and eigenvalue of 1,3567 explains 9,04 % of the total variance between factors. This factor primarily differentiates between **occupational groups** (WHITEC, loading 0,500 and PROF, loading -0,449). The occupational differentiation is coupled with large families (PER6, loading, 0,407) residing in large owner-occupied housing (ROOM6, loading 0,361; BATH1, loading -0,326; OWNER, loading 0,298).

Table 5.6 SORTED FACTOR LOADING MATRIX OF FACTORS RETAINED[a]

Factor 1				Factor 2				Factor 3				Factor 4			
Variable +		Variable -		Variable +		Variable -		Variable +		Variable -		Variable +		Variable -	
5	0,701	-0,691	23	25	0,552	-0,468	8	10	0,784	-0,443	8	3	0,500	-0,449	2
11	0,659	-0,548	24	24	0,529	-0,414	20	3	0,538	-0,396	11	14	0,407	-0,384	10
25	0,591	-0,516	22	22	0,479	-0,353	3	12	0,353	-0,338	2	22	0,361	-0,326	20
20	0,550	-0,486	2	2	0,463							16	0,298		
12	0,463	-0,334	8	12	0,440										
		-0,304	15	16	0,397										
				5	0,384										
				11	0,330										
				23	0,329										

	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalue:	3,3180	2,3960	1,7458	1,3567
% of variance:	22,12	15,97	11,64	9,04
Cumulative %:	22,12	38,09	49,73	58,78

[a] Variable numbers according to table 5.2 and only factor loadings -0,250 < F < 0,250 are displayed.

5.2.2 Sampling zone delimitation

Making use of procedure RELOCATE in the CLUSTAN cluster analysis programs the 910 respondents were grouped into 5 clusters. Procedure RELOCATE is an iterative relocation procedure to find a local optimum for k clusters in relation to any of 13 intercluster similarity or dissimilarity criteria. For the purpose of this phase of the study the number of initial clusters and terminal clusters specified were 10 and 2 respectively. The dissimilarity criterion employed was the error sum of squares, also referred to as the euclidean or within-groups sum of squares. The input data were the factor scores of each respondent on the first four factors identified previously.

The basic process of procedure RELOCATE is described as: "Starting with a classification of the population of N objects into k clusters, during one relocation scan each object is considered in turn and its similarities with all k clusters are computed. Suppose that the similarity between object X and its parent cluster P is S (P,X) and the similarity between X and any other cluster Q is S(Q,X), then if S(Q,X) exceeds S(P,X) the method moves X from cluster P to cluster Q. The centroids of clusters P and Q are recomputed to account for this change at the time that the switch occurs (i.e. at cycle X of the relocation scan - not at the end of the scan). The population is repeatedly scanned until no objects are relocated during one full scan, when a local optimum solution for k clusters in terms of the similarity function S will have been obtained. ...

Next, the similarities between all pairs of clusters are computed and those two clusters which are most similar are fused, thereby reducing the classification to (k - 1) clusters. The relocation phase is repeated to obtain a local optimum for (k - 1) clusters, and then the fusion phase is repeated to yield (k - 2) clusters. In this way, local optimum solutions for all clustering from k to MINC are obtained, where MINC is the number of terminal clusters specified by the user" (Wishart, p. 43).

The error sum of squares was selected as clustering criterion since: "The error sum of squares is suitable for finding tight clusters which have the property that each cluster centre represents the constituent cases at a high level of similarity with respect to all the underlying variables. Such partitions are often useful for administrative purposes, e.g. when it is desirable to find a relatively small number of 'typical' cases. They can also be of value as an initial step in the study of a mixture problem, where it can be instructive to reduce a sample scatter into a number of factor clumps in order to search for regions of contiguous density" (Wishart, p. 115).

The aggregation of the 910 respondents into 5 terminal clusters was decided on after an evaluation of the number of cases per cluster as well as the cluster means of 16 variables serving as indicators of socio-economic status, stages in the family life cycle, housing tenure and housing characteristics, for the respondents aggregated into 10 to 2 clusters. The 5-cluster aggregation presented, for the purpose of sampling zone delineation, the most meaningful interpretation and possibility for further analysis. Where the number of clusters were less than

5, the respondents were too highly aggregated, while with more than 5 clusters the disaggregation was too high.

The 5 clusters of respondents reflect a marked socio-economic status differentiation, but which is strongly coupled with stages in the family life cycle as well as occupational types.

The cluster means of the 16 indicators of socio-economic status, life cycle, housing tenure and housing characteristics are set out in table 5.7.

The members of cluster 1 have a high socio-economic status with an average annual income of R27 509,41, an average educational level of 15,39 years and 96,77 % of the household heads are employed in professional occupations. The households occupy large homes, 87,10 % of the homes have 6 or more rooms with only 16,67 % having 1 bathroom.

The majority of the houses are owner-occupied (91,40 %). The families are reasonably young and in the child-rearing stage of the family life cycle. The average age of the household head is 42,09 years and 10,66 % and 24,73 % of the household members are between 1 and 5 years and 6 and 18 years old respectively. In a third of the cases (34,41 %) the mother is employed in the labour market - this is, however, the second lowest incidence of mothers working.

Employees in white-collar occupations are grouped in clusters 2 and 3. 80,18 % and 73,65 % of the household heads are employed in white-collar occupations in clusters 2 and 3 respectively.

Table 5.7 VALUE PER CLUSTER OF VARIOUS SOCIO-ECONOMIC STATUS, LIFE CYCLE, HOUSING TENURE AND HOUSING CHARACTERISTIC INDICATORS.[a]

Indicator	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
INCOME	R27 509,41	R24 576,58	R18 736,53	R13 826,31	R11 611,98
EDUC	15,39years	11,67years	11,37years	10,61years	10,97years
AGE	42,09years	42,57years	48,31years	36,95years	63,53years
PROF	96,77 %	0,00 %	5,99 %	4,60 %	1,04 %
WHITEC	0,00 %	80,18 %	73,65 %	41,00 %	9,38 %
BLUEC	2,15 %	19,82 %	20,36 %	54,40 %	5,20 %
NONLAB	1,08 %	0,00 %	0,00 %	0,00 %	84,38 %
A	10,66 %	7,05 %	0,00 %	17,86 %	0,00 %
C	63,89 %	56,11 %	94,84 %	51,05 %	69,76 %
D	0,72 %	0,23 %	0,00 %	0,00 %	25,35 %
PER2	17,20 %	0,45 %	67,07 %	0,42 %	62,50 %
PER6	7,53 %	16,67 %	0,00 %	10,04 %	0,00 %
OWNER	91,40 %	92,34 %	86,83 %	63,60 %	89,58 %
BATH1	16,67 %	17,57 %	72,46 %	85,36 %	72,92 %
ROOM6	87,10 %	85,59 %	34,73 %	10,88 %	35,42 %
MOTHER	34,41 %	48,20 %	42,51 %	35,98 %	9,38 %
n	186	222	167	239	96

[a] An explanation of the codes of the indicators are set out in table 5.2.
n = number of respondents per cluster

There are, however, large differences between the two groups in respect of their socio-economic status, their stage in the family life cycle and the characteristics of the homes occupied. The members of cluster 2 have a higher socio-economic status than those of cluster 3. Their household incomes are higher (R24 576,58 against R18 736,53), the educational level of the head of the household is higher (11,67 years against 11,37 years), a larger percentage of the household heads are employed in white-collar occupations while a smaller percentage are blue-collar workers (19,82 % against 20,36 %).

The housing occupied by the two groups also differs greatly. Households in cluster 2 occupy larger homes than those in cluster

3. 85,59 % of the homes in cluster 2 have 6 or more rooms while only 34,73 % of the homes in cluster 3 are of similar size. Furthermore, 72,46 % of the homes in cluster 3 have 1 bathroom while only 17,57 % of the homes in cluster 2 have 1 bathroom. The incidence of homes being occupied by the owner is also greater in cluster 2 than 3 (92,34 % against 86,83 %).

The biggest difference between the two groups, however, is in respect of stages in the family life cycle. Cluster 3 is characterised by older families with very few children still at home. The average age of the head of the household is 48,31 years, there are no children in the age group 0 - 5 years while only 5,16 % of the household members are between 6 and 18 years old. The rest of the household members are between 19 and 64 years of age. 2-member households are in the majority in this group with 67,07 % of the households consisting of 2 or fewer members only.

The households in cluster 2 can be described as being in the child-rearing stage of the family life cycle. The average age of the household head is 42,57 years, 7,05 % of the household members are between 0 and 5 years old and 36,61 % are between 0 and 18 years old. Only 0,45 % of the households in this group are 2- or fewer person households with 16,67 % of the households consisting of 6 or more members.

The households in cluster 4 are of a lower socio-economic status than those in clusters 1, 2 and 3. The households grouped in this cluster can be described as of a low socio-economic status, in the child-rearing stage of the family life cycle. The average income of households at R13 825,31 is well below that of the households in clusters 1, 2 and 3. The average educational level of the head of the household is 10,61 years while the majority of the household heads are employed in blue-collar occupations (54,40 %).

The average age of the head of the household is 36,95 years with 17,86 % of the household members between 0 and 5 years old, 31,09 % between 6 and 18 years and 51,05 % between 19 and 64 years of age. There are no household members 65 years or older. It was further found that 0,42 % of the households consist of 2 or fewer members.

The homes occupied by members of this cluster are small (10,88 % of the houses have 6 or more rooms while only 14,64 % have 2 or more bathrooms) and 63,60 % of the homes (the lowest proportion for all clusters) are owner-occupied.

In cluster 5 are grouped households of a low socio-economic status in the late life-cycle stage. The average income of the households is R11 611,98 and the average educational level of the head of the household is 10,97 years. 84,38 % of the household heads are retired or unemployed while only 9,38 % of the mothers in this cluster are employed. The members of the households are mostly older people with the average age of the head of the household 63,53 years. Furthermore, 25,35 % of the household members are 65 years or older, 69,76 % are between 19 and 64 years of age and only 4,89 % are between 6 and 18 years old. The homes occupied by these households are small with 35,42 % of the homes having 6 and more rooms and 72,92 % having 1 bathroom.

The 5-cluster aggregation of households clearly distinguishes between various socio-economic status groupings. The households in cluster 1 have the highest socio-economic status with the socio-economic status of the households in the other clusters descending hierarchically through to cluster 5. The socio-economic status of the households is closely related to the occupational grouping of the head of the household. The majority of the heads of households in cluster 1 are employed in professional occupations, those in clusters 2 and 3 in white-collar occupations, those in cluster 4 in blue-collar occupations while the majority of household heads in cluster 5 are retired or unemployed.

The households in clusters 1, 2 and 4 are in the child-rearing stage of the family life cycle with the households in clusters 3 and 5 in the later stage of the family life cycle. Clusters 1 and 4 are in an earlier stage than cluster 2 and it was also found that only 34,41 % and 35,98 % of the mothers in clusters 1 and 4 are employed in the labour market, an indication that mothers with very young children are not working in order to assist with the raising of the younger children. 48,20 % and 42,51 % of the mothers in clusters 2 and 3 respectively are employed in the labour market. Households in these two clusters are at later stages of the family life cycle than the households in clusters 1 and 4.

The majority of the homes in all 5 clusters are owner-occupied but the homes in clusters 1 and 2 are larger than those in clusters 3, 4 and 5. More than 70 % of all homes in clusters 3, 4 and 5 have only 1 bathroom while in clusters 1 and 2 more than 80 % of the homes have 2 or more bathrooms. A similar situation exists with regard to the number of rooms. More than 85 % of the homes in clusters 1 and 2 have 6 or more rooms with less than 35 % of the homes in clusters 3, 4 and 5 being of a similar size.

To determine whether the 5 respondent clusters exhibited a spatial locational pattern and thus identify homogeneous socio-geographic areas, the 5 categories of households were transferred on to a map of the study area. Through the visual inspection of the distribution of the cluster types, and taking into consideration physiographic features, the spatial continuity of physical space and natural and man-made barriers and discontinuities, 57 spatial zones, enclosing a majority of households of a similar cluster, were delineated. The 57 zones are set out in figure 1.

Owing to the dynamically changing urban ecology of an expanding urban area such as Bloemfontein, it was not possible to delineate meaningful zones enclosing respondents exclusive to one cluster category. All the zones contained a mix of cluster types but with the majority of respondents (≥ 70 %) being of one cluster category only.

To reduce the 57 zones to a smaller number of aggregate homogeneous geographic areas, cluster analysis through procedure RELOCATE was performed on the 57 zones. 10 initial clusters and 2 terminal clusters were specified. The input data were the mean values of the 15 variables set out in table 5.7 for the respondents in each zone (BLUEC was excluded while a square root transformation was performed on INCOME and a logarithmic transformation was performed on EDUC and AGE)[2] It was again found through an inspection of the mean values per cluster and the number of zones per cluster that a 5-cluster division presented the best aggregation of the 57 zones. The spatial distribution of the 5 geographic area types is set out in figure 2 and the mean values of various indicators of socio-economic status, stages in the family life cycle, housing tenure and housing characteristics are recorded in table 5.8.

The 5 geographic areas identified are clearly ordered in terms of socio-economic status. Geographic area 1 has the highest socio-economic status with the socio-economic status of the other geographic areas decreasing hierarchically through to geographic area 5.

There is a marked decrease, from geographic area 1 to 5, in the values of the indicators of a high socio-economic status, namely: Income of the household (INCOME), educational level of the head of the household (EDUC), percentage of the heads of households employed in professional occupations (PROF), homes occupied by the owner (OWNER) and large homes with 6 or more rooms (ROOM6). Conversely the values of the indicators of a low socio-economic status show a marked increase with a decrease in socio-economic status: percentage of the heads of households employed in blue-collar occupations (BLUEC), percentage of the heads of households unemployed or retired (NONLAB) and percentage of homes with 1 bathroom (BATH1). The percentage of the heads of households

[2] The 15 variables are the same as those used in the final factor analysis undertaken previously.

Table 5.8 VALUE PER GEOGRAPHIC AREA OF VARIOUS SOCIO-ECONOMIC STATUS, LIFE CYCLE, HOUSING TENURE AND HOUSING CHARACTERISTIC INDICATORS.[a]

Indicator	Geographic area 1: High socio-economic status	Geographic area 2: Middle high socio-economic status	Geographic area 3: Middle socio-economic status	Geographic area 4: Middle low socio-economic status	Geographic area 5: Low socio-economic status
INCOME	R35 150,33	R27 243,71	R21 189,25	R16 396,73	R11 709,80
EDUC	14,92years	13,59years	12,32years	11,18years	10,13years
AGE	42,84years	44,03years	41,77years	43,57years	46,97years
PROF	61,37 %	37,88 %	26,19 %	7,55 %	4,50 %
WHITEC	38,63 %	47,36 %	52,64 %	47,47 %	33,06 %
BLUEC	0,00 %	10,16 %	16,57 %	34,31 %	42,24 %
NONLAB	0,00 %	4,60 %	4,60 %	10,67 %	20,20 %
A	9,80 %	7,54 %	10,92 %	9,45 %	7,36 %
C	60,00 %	64,97 %	65,31 %	66,01 %	62,90 %
D	0,00 %	1,41 %	2,01 %	2,43 %	6,38 %
PER2	12,68 %	16,73 %	22,03 %	24,94 %	27,11 %
PER6	9,76 %	8,58 %	6,83 %	9,50 %	7,85 %
OWNER	91,76 %	89,12 %	88,02 %	85,68 %	66,32 %
BATH1	17,08 %	15,20 %	31,72 %	70,05 %	88,29 %
ROOM6	91,67 %	88,23 %	64,61 %	28,01 %	13,78 %
MOTHER	40,48 %	40,65 %	34,06 %	41,31 %	37,42 %
n	6	14	16	11	10

[a] An explanation of the codes of the indicators are set out in Table 5.2.
n = number of zones per geographic area.

employed in white-collar occupations reflects an expected tendency, namely an increase in the percentage with a decrease in socio-economic status from the high socio-economic status geographic area to the middle socio-economic status geographic area, then a decrease in the percentage with a decrease in socio-economic status from the middle socio-economic status geographic area to the low socio-economic status geographic area.

Indicators of stages in the family life cycle do not vary greatly from geographic area to geographic area. The majority of families in the 5 geographic areas are in the child-rearing stage of the family life cycle, although the number of retired people do show an increase in the percentage of household members 65 years and older (D) with a decrease in the socio-economic status. The mean age of the household heads varies between 41,77 years (middle socio-economic status geographic area) and 46,97 years (low socio-economic status geographic area).

An interesting feature is that the households in the later stage of the family life cycle with a low socio-economic status identified as cluster 5 in the cluster analysis undertaken in respect of the 910 respondents, do not occupy and concentrate in a specific area. A spatial area with regard to these households was thus not identified and it would appear that older households (excluding inhabitants of old-age homes or retirement housing) occupy homes distributed throughout the study area.

A sectorial spatial distribution pattern is exhibited by the geographic areas. This is to be expected, since the geographic areas are primarily an expression of the concentration of households of similar socio-economic status. The pattern is in accordance with the evidence of factorial ecology studies undertaken in various western countries where the socio-economic status dimension is similarly sectorially distributed (Robson, 1973, p. 220).

The low socio-economic status geographic area is situated concentrically around the CBD and frame (zones 16, 22, 26 and 27).[3] It has sectorial extensions extending south-westward and north-eastward along the main north-south railway line (zones 14, 15, 42, 43 and 52). The low socio-economic status geographic area thus serves as a buffer between the perceived negative

[3] The zone numbers are those in figure 1.

externalities of the Black and Coloured residential areas, the CBD and frame, the industrial areas that are situated in the eastern half of the city, the railway marshalling yards and the more desirable residential areas occupied by the high, middle-high and middle socio-economic status households.

The low socio-economic status geographic area has a second sectorial extension extending westwards from the CBD along the Kimberley railway line (zone 29).

The middle-low socio-economic status households congregate in areas that have a similar sectorial distribution. These areas are in most cases located on the periphery of the low socio-economic status sectors. Thus zone 12 is an extension to the low socio-economic sector formed by zones 14, 15 and 16. Zones 39, 49, 50, 53 and 55 form an extension to the low socio-economic status sector formed by zones 26, 27, 42 and 52. The middle-low socio-economic sector formed by zones 30 and 31 runs parallel to the low status zones 27 and 29. Zones 24 and 25 form a middle-low socio-economic status sector to the north-east of the CBD.

The middle socio-economic status geographic area does not exhibit a clear sectorial distribution pattern. It would appear that this status area forms a buffer between the low and middle-low socio-economic status geographic areas and the high and middle-high socio-economic status geographic areas, as can be seen in respect of zones 11, 13, 17, 21, 23 and 54. Clusters of households of a middle socio-economic status are also located in the high and middle—high socio-economic sectors. Areas occupied by these households are, however, not as desirable owing to negative externalities such as distance from the CBD (zones 11, 33, 35, 44, 54 and 56), negative physiographic features (zones 3 and 4) and positions adjacent to main traffic routes (zones 33, 35 and 44). Households of a middle socio-economic status do, however, occupy physiographically desirable areas, but these are in close proximity to or surrounded by areas occupied by low and middle-low socio-economic status households (zones 41 and 51).

The middle-high and high socio-economic status geographic areas comprise three distinct sectors. The most prominent sector runs northward from the CBD and comprises zones 1, 2, 5, 6, 7, 8, 9, 10, 18, 19 and 20. The middle-high socio-economic status geographic area occupies the relatively less desirable areas within the sector. The second sector extends westward from the CBD (zones 32, 34 and 57) and is situated around the University of the Orange Free State. The third sector is situated to the south-west of the CBD and is bounded by the Kimberley railway line, the Jagersfontein road and the N2 bypass (zones 36, 37, 38, 46, 47 and 48).

The geographic areas identified served as basis for the determination of the sampling zones and 45 sampling zones as indicated in figure 3 were delineated. All contiguous housing regions, but for two exceptions, were retained as individual sampling zones.

The middle-high socio-economic geographic area to the south-west of the CBD and situated between the Kimberley railway line, the Jagersfontein road and the N2 bypass, was divided into two sampling zones; zones 27 and 32. Zone 32 is a new residential development, the first lots being sold on 26 April 1982 and the area is still in a state of flux with the social, economic, housing and physical structures not well developed and established. The last lots in zone 27, except for a few properties scattered throughout the zone, were sold and developed during 1977. The zone is thus well developed with established social, economic, housing and physical structures. The difference in the stages of development may ultimately be reflected in the price of housing.

The Langenhoven Park middle socio-economic status area was divided into three individual sampling zones; zones 41, 42 and 43. The mean lot size differs vastly between the three areas. This is having a direct influence on the type and size of residential development that is taking place in the zones and on the price being paid for housing. The mean lot size in sampling zone 41 is 1948 m^2, in sampling zone 42 it is 1 264 m^2 and in sampling zone 43 1 434 m^2.

5.3 Sampling procedure

A search of all property transfers that had taken place between 1 January 1983 and 16 June 1984 was undertaken at the Bloemfontein Deeds Office to determine which of the 15 511 single and semi-detached houses had been sold between 1 January 1983 and 31 March 1984 and transferred prior to 16 June 1984. These properties were all potential members of the sample population.

As only owner-occupied houses sold in "at arm's length transactions" were to be included in the sample, houses excluded as potential sampling units were those:

1) purchased by companies,

2) sold by companies to members and personnel of the companies,

3) purchased by large property holders for the purpose of letting the houses,

4) sold out of deceased or insolvent estates,

5) sold between family members,

6) sold and transferred without any money being exchanged. The price of the property for the purpose of determining transfer duties was thus based upon a sworn appraisement or valuation.

Properties that were sold more than once were retained as a potential sampling unit but only information with regard to the last sale was used in the study.

Of 2 193 sales and transfers recorded 582 were excluded in terms of the aforementioned criteria. 1 611 houses thus formed part of the sampling frame - this represents 73,46 % of all single and semi-detached houses sold and transferred within the study period. A full exposition of the number and percentage of the houses sold, excluded and retained is given in table 5.9.

A 55,00 % random sample without replacement was drawn separately for single and semi-detached houses per sampling zone with a minimum of 3 respondents per sampling zone. An additional 20 % random sample without replacement was also drawn per sampling zone. These additional sampling units would replace any houses

Table 5.9 HOUSES SOLD AND TRANSFERRED, EXCLUDED FROM AND RETAINED IN STUDY.

	Total number of houses sold and transferred	% of houses sold and transferred	Number of houses excluded	Number of houses retained	% of houses retained
Bloemfontein	2 031	92,61	555	1476	91,62
Langenhoven Park	162	7,39	27	135	8,38
Total	2 193		582	1 611	

that had been resold subsequent to the relevant sales period, had been demolished, were being rented or were vacant.

As can be seen from table 5.10, only two and one sampling units were drawn in sampling zones 25 and 29 respectively. This was due to just two sales taking place in sampling zone 25 and only one sale in sampling zone 29. In respect of sampling zones 7, 19 and 37 the percentage sampling units drawn was substantially greater than 55,00 % owing to the minimum requirement of 3 sampling units per sampling zone. A similar situation arose in respect of the semi-detached houses in sampling zone 24 (refer to table 5.11).

The basic information required for the study was collected at various sources. Dates of sale, sales price and names of seller and purchaser were extracted at the Bloemfontein Deeds Office. The City Valuator of Bloemfontein provided his records from which data in respect of site values, building values, area of the sites and area and date of construction of the buildings were gathered. Contour maps and the town planning scheme and accompanying maps were provided by the Bloemfontein City Council and Bainsvlei Town Board. Data on the occupants of the houses

Table 5.10 SUMMARY OF COMPLETED SINGLE HOUSES, POPULATION, SAMPLE, RESPONSE AND NON-RESPONSE PER HOUSING AREA

Geographic area	Completed houses	% of total number of houses	Sales	% of houses in study area sold	Sample	Sample as % of houses houses sold	Response	Non-response	Non-response as % of sample
1	196	1,29	22	11,22	12	54,55	11	1	8,33
2	527	3,48	60	11,39	33	55,00	27	6	18,18
3	570	3,76	40	7,02	22	55,00	19	3	13,64
4	161	1,06	15	9,32	8	53,33	8	-	-
5	533	3,52	55	10,32	31	56,36	30	1	3,23
6	260	1,72	7	2,69	4	57,14	2	2	50,00
7	110	0,73	4	3,64	3	75,00	3	-	-
8	123	0,81	6	4,88	3	50,00	3	-	-
9	237	1,56	11	4,64	6	54,55	5	1	16,67
10	252	1,66	19	7,54	11	57,89	9	2	18,18
11	226	1,49	8	3,54	4	50,00	2	2	50,00
12	152	1,00	15	9,87	8	53,33	8	-	-
13	955	6,30	80	8,38	45	56,25	36	9	20,00
14	285	1,88	40	14,04	22	55,00	19	3	13,64
15	255	1,68	24	9,41	13	54,17	13	-	-
16	373	2,46	30	8,04	17	56,67	15	2	11,76
17	82	0,54	5	6,10	3	60,00	2	1	33,33
18	656	4,33	52	8,54	29	55,77	25	4	13,79
19	87	0,57	3	3,45	3	100,00	3	-	-
20	440	2,90	26	5,91	14	53,85	14	-	-
21	501	3,31	30	5,99	16	53,33	15	1	6,25
22	305	2,01	30	9,84	17	56,67	17	-	-
23	818	5,40	58	7,09	32	55,17	32	-	-
24	136	0,90	12	8,82	7	58,33	7	-	-
25	43	0,28	2	4,65	2	100,00	0	2	100,00
26	235	1,55	12	5,11	7	58,33	5	2	28,57
27	1 710	11,29	146	8,54	81	55,48	74	7	8,64
28	5	3,79	23	4,01	13	56,52	12	1	7,69
29	48	0,32	1	2,08	1	100,00	1	-	-
30	388	2,56	80	20,62	44	55,00	43	1	2,27
31	128	0,84	10	7,81	6	60,00	6	-	-
32	298	1,97	135	45,30	75	55,56	62	13	17,33
33	935	6,17	83	8,88	46	55,42	34	12	26,09
34	179	1,18	11	6,15	6	54,55	6	-	-
35	618	4,08	41	6,63	23	56,10	22	1	4,35
36	215	1,42	17	7,91	9	52,94	6	3	33,33
37	66	0,44	3	4,55	3	100,00	1	2	66,67
38	67	0,44	6	8,96	3	50,00	3	-	-
39	333	2,20	78	23,42	44	56,41	35	9	20,45
40	552	3,64	61	11,05	35	57,38	33	2	5,71
41	103	0,68	20	19,42	11	55,00	7	4	36,36
42	147	0,97	95	64,63	53	55,79	52	1	1,89
43	47	0,31	20	42,55	11	55,00	10	1	9,09
44	165	1,09	78	47,27	44	56,41	44	-	-
45	60	0,40	6	10,00	3	50,00	3	-	-
Total	15 151		1 580	10,43	883	55,89	784	99	11,21

Table 5.11 SUMMARY OF COMPLETED SEMI-DETACHED HOUSES, POPULATION, SAMPLE, RESPONSE AND NON-RESPONSE PER HOUSING AREA.

Geographic area	Completed semi-detached houses	% of total number of semi-detached houses	Sales	% of semi-detached houses in study area sold	Sample	Sample as % of semi-detached houses sold	Response	Non-response	Non-response as % of sample
13	6	1,67	-	-	-	-	-	-	-
15	2	0,56	-	-	-	-	-	-	-
16	10	2,78	-	-	-	-	-	-	-
17	8	2,22	-	-	-	-	-	-	-
23	250	69,44	27	10,80	15	55,56	14	1	6,67
24	24	6,67	4	16,67	3	75,00	3	-	-
25	10	2,78	-	-	-	-	-	-	-
26	50	13,89	-	-	-	-	-	-	-
Total	360		31	8,61	18	58,06	17	1	5,56

Table 5.12 SUMMARY OF COMPLETED SINGLE AND SEMI-DETACHED HOUSES, POPULATION, SAMPLE, RESPONSE AND NON-RESPONSE FOR TOTAL STUDY AREA

	Completed single and semi-detached houses	Sales	% of all houses in study area sold	Sample	Sample as % of all houses sold	Response	Non-response	Non-response as % of sample
Single houses	15 151	1 580	10,43	883	55,89	784	99	11,21
Semi-detached houses	360	31	8,61	18	58,06	17	1	5,56
Total	15 511	1 611	10,39	901	55,93	801	100	11,10

purchased were collected through personal interviews and the completion of an extensive questionnaire.

To keep the non-response frequency at a minimum, a respondent was, if he could not be contacted the first time, approached on a further 2 occasions. This resulted in all targeted respondents being contacted. All targeted respondents, however, were not owner-occupiers, while some were occupying houses that had been resold subsequent to the sales period. In these instances the respondent was replaced by an alternative respondent. If the occupier of a specific house was not the targeted respondent as recorded from the deeds search but was the owner of the house - the house had thus been resold but had not yet been transferred - the questionnaire was directed at that occupier. The date of the new sale must, however, have been between 1 January 1983 and 31 March 1984.

Not all respondents were prepared to complete the questionnaire. This resulted in a 5,56 % non-response for semi-detached houses, a 11,21 % non-response for single houses and a 11,10 % overall non-response. The non-response frequency was kept at a relatively low level by the decision that all targeted respondents should be contacted.

CHAPTER 6

DETERMINANTS OF HOUSE PRICES

To appreciate the potential influence of any single attribute or group of attributes on the price of a house and to make a reliable estimate of their effect, it is imperative to understand the underlying structure of the determinants of house prices (Wilkinson, p. 72). In this chapter an endeavour is made to develop a theory of house price differentials, without attempting to be definitive. A conceptual framework to facilitate the disaggregation of the attributes of housing is presented and a methodology to analyse the relative contribution of an attribute or a group of attributes of a house to the price of that house, is discussed. A generalised theoretical model of the market price functions of housing as well as an extended theoretical model of housing price functions, to take account of the effect of submarkets, is also constructed.

Normally this would be the appropriate section to give an exposition of the data selected and used in the study. However, owing to the unusually extensive data matrix that was available, the large number of derived variables and common factors that are calculated and used and the fact that sections of the data are used in one application and not another, an explanation and indication of the choice and selection of specific variables will only be given prior to the application of a specific statistical procedure. This is done within the chronological development framework of the study to assure the logical presentation of the progressive methodological development of the study and of the results and conclusions flowing from the study.

6.1 Housing services

When a household purchases or rents a house, certain benefits and disadvantages will flow to the household by virtue of it occupying the house. These benefits and disadvantages constitute an extensive bundle of housing services which are consumed by a household to satisfy or partially satisfy its housing-consumption needs. These housing-consumption needs are derived from the demand for shelter, living space and recreational space; for accessibility to, proximity to and separation from certain other activities; for investment opportunities; for security, safety, public utilities and public services; for a key to a desired social and physical environment; and for a symbol of social status and of the position occupied within the social system of the city.

The series of services that households expect or are led to expect from the consumption of housing include 1) **shelter,** that is a place for the production and consumption of food, for relaxation, recreation, sleeping and protection from the elements; 2) **financial equity,** especially for owners, as housing is an attractive vehicle for wealth accumulation while its durability makes it a suitable source of investment for some household savings and for a certain measure of capital gain in an inflationary market. Housing also presents households with 3) various levels of **accessibility** and **proximity to** and **separation from** desired and undesired land uses. It also serves as a base for household excursions to places of work, shopping, recreation and leisure activities; with 4) a set of **physical** and **social environmental services** which result from occupying housing of particular kinds in specific neighbourhoods; with 5) a basket of **protective, recreational, maintenance** and **supportive** services such as police, local government, parks, schools, hospitals and public utilities and amenities; and with 6) **satisfaction** and **status** as housing is an indirect indicator of social standing and status and contributes in part to defining a set of social relations maintained by the household (Bourne, 1976, p. 113; Bourne, 1981, p. 14; Carvalho *et al.*, p. 191; Quigley, p. 35; Whitbread *et al.*, p. 194).

6.2 Housing attributes

The housing services that flow to a household through the consumption of a specific house, are a function of the bundle of complex and heterogeneous underlying attributes that are intrinsic to that house.

These attributes can be classified into four broad categories. These categories are: attributes of the property itself; attributes relating to the environment in which the dwelling is situated; attributes relating to the relative location and accessibility of the dwelling to other land uses; and attributes relating to institutional behaviour and constraints applicable to the individual house in particular and the housing market in general.

6.2.1 Attribute of the property itself

The attributes of the property itself can be subdivided into the **site characteristics** of the property, the **structural development** thereon and the **legal rights and impediments** embodied therein. The site characteristics and structural development can vary in quantity and quality.

The first factors that households take into consideration when making a choice among houses are the basic characteristics of the structure; thereafter the specific details of the improvements of the house enter the decision equation (Berry, 1976, p. 404). The most important factors determining the price of a dwelling unit are thus the attributes of the house itself. The choice of a specific composition of housing goods is made in terms of the household's housing-space needs.

The quantity of the structural improvements of a specific property will obviously have a very large influence on its market price and there is a positive correlation between price and the size of the dwelling, the number of bedrooms, the number of garages, the size of the basement and attic, etc. as various studies have found (Berry, 1976, p. 405; Berry et al., 1975, p. 31; Carvalho, p. 193; Schnare et al., p. 156; Walsh et al., p. 28; Zerbst et al., p. 14.)

The quality of housing also plays an important part in house price determination. Similar dwellings in terms of size and amenities, with the influence of neighbourhood, location, accessibility and institutional constraints being constant, will have vastly different prices if there is a large difference in age, quality of workmanship, quality of materials, type of house, etc. Criteria that have been used to serve as an indication of housing quality are age, which in nearly all studies is seen as the basic indicator of quality; items that are basic to the safety and utility of the dwelling (these items are usually present in new dwellings but have to be replaced in older dwellings) such as modern electric circuits and modern plumbing (a fixed bath and an inside toilet); measures of nonessential luxury items such as central air-conditioning, fireplaces, built-in washers, stoves, garbage-disposal units, swimming pools and tennis courts; condition factors such as condition of walls, ceilings, roof and exterior; and the quality of construction. The density of room habitation, which correlates with the size of rooms (an indicator of dwelling size), has also been used as a quality indicator (Berry, 1976, p. 405; Berry et al., 1975, p. 31; Carvalho, p. 193; Richardson et al., 1975, p. 72; Schnare et al., p. 153; Walsh et al., p. 27; Wilkinson, p. 77; Zerbst et al., p. 9).

A similar situation exists in respect of the characteristics of the site on which the dwelling is situated. The size of the lot will have a positive influence on the price of the property and larger sites, all things being equal, will generally fetch a higher price than smaller sites. This increase in price will, however, take place at a decreasing rate with an increase in lot size (Colwell, p. 518).

Quality aspects of the site can also greatly influence the ultimate market price of the property. Aspects such as view, quality of soil for construction purposes, gradient, height and shape of the lot are aspects that also contribute to the services that are produced by a dwelling and are thus taken into consideration by prospective consumers of housing.

Certain individual properties have legal impediments registered against them that prevent the full use and exploitation of the property. These legal impediments include variations in the degree, scope and duration of the rights of possessions; limitations on the negotiability of these rights of possession; as well as restrictive covenants such as servitudes, building restrictions and building-line restrictions (Whitbread, p. 196). The legal impediments referred to here are impediments applicable to individual or groups of individual properties and do not include general restrictions such as town planning schemes or land use restrictions.

6.2.2 Attributes relating to the environment in which the dwelling is located

The second step in the process of obtaining a house is for the household, after it has defined its desired dwelling and site characteristics, to locate the dwelling within the variable residential structure and residential surface of the urban area. As a result of the propensity of households of similar social status, and in some instances similar ethnic status and stages in the family life cycle, to congregate in discrete residential areas and the tendency of people with high incomes to pre-empt locations with positive spatial externalities, the social and physical environment of dwellings has an important influence on the price of the dwelling. The segregationalist tendencies are, however, not restricted to the consumers of housing. The suppliers of housing, through the control of the provision of credit and information, also regulate the allocation of housing and endorse and maintain the differentiation of the urban housing structure.

The important role of the relative location of a house in respect of external environmental factors in determining the price of the house has been identified by various researchers (Goodman, A.C., p. 473; Walsh et al., p. 23; Wilkinson et al., p. 358; Zerbst et al., p. 2). Since all past and potential home buyers know that where a house is situated, makes a big difference to how much they might be prepared to pay for it (Richardson et al., 1974, p. 193), it is essential that environmental attributes of the area in which the house is situated should be included in the study. Zerbst and Eldred state that: "Because of the importance of location as a determinant of value, multiple regression equations that adequately include location characteristics as independent variables are likely to be more accurate and dependable predictors of market value because they are more descriptive of housing market behaviour" (p. 2).

The environment of the house can be differentiated into the **physical environment, social environment** and **fiscal environment.** Since housing services have to be consumed in a fixed location, the quality of the surrounding physical, social and fiscal environment of the dwelling is an important element in the determination of market price (Sumka, p. 908) and it has been found that, when environmental and locational attributes are omitted from estimation equations, the physical characteristics of the house tend to act as proxies for these omitted attributes (Zerbst et al., p. 2).

Positive environmental externalities attract competition for housing, lead to an increased demand for housing and give rise to a higher price for housing. Negative externalities will not attract the same measure of competition, with a concomitant decrease in house prices.

Physical environmental externalities comprise man-made and natural physical attributes of the environment. Under these attributes are grouped characteristics of the quality of the environment and the quantity and quality of the stock of dwellings that comprise the neighbourhood. The stock of dwellings that comprise a locality is an important indicator of the relative desirability of that locality, since the dwelling is usually a good reflection of the status and status awareness of its inhabitants. High-quality dwellings (and thus higher status areas) are not found in localities with a large number of negative externalities and a small number of positive externalities - thus areas with a low desirability.

Variables included in previous studies to characterise the physical environment of a specific dwelling are sulphur dioxide intensities, suspended particulates, percentage of properties situated within zones of heavy smoke pollution, percentage of properties subject to unstable soils for building purposes, proportion of dwellings of certain types, proportion of dwellings possessing a garage, proportion of dwellings in a specific age category, percentage of houses with no fixed bath, an outside toilet, the condition of adjacent dwellings, the presence of trees and natural vegetation, condition of the neighbourhood, size of neighbouring dwellings and presence of a scenic view (Berry et al., 1975, p. 27; Senekal, 1977, p. 34; Wilkinson et al., p. 359; Zerbst et al., p. 7).

The social environment of a dwelling encompasses factors related to the characteristics of the people living in the vicinity of the dwelling and it includes aspects such as the socio-economic status, ethnic status, family status and pride of ownership of these residents. The indicators of the socio-economic status, ethnic status, family and mobility status are the traditional factor-ecological measures while pride of ownership can be measured by quality indicators such as the condition of the surrounding dwellings and the degree of garden development and upkeep.

The final category of environmental factors influencing the market price of housing is the fiscal environment of the dwelling. This category of factors refers to the general fiscal attractiveness of a neighbourhood - that is the level of tax liabilities - and the perceived level of public services supplied to residents. Indicators of the general fiscal attractiveness that have been used are the amount of property tax payable, the school tax rate and the fire-district tax rate, while the level of public services made available to residents has been measured by the annual amount of school expenditure per pupil (Schnare et al., p. 153; Walsh et al., p. 27).

The physical, social and fiscal environment of any dwelling is of great significance to the price of housing and potential consumers of housing take these factors into consideration while in the process of price fixing. The level of the prices set by the suppliers of housing will also be influenced by the environmental characteristics to which the dwelling is subjected, while the decisions of the suppliers of credit and agents of the allocation of housing are shaped by the spatial variability of these general environmental factors. Included in the description of housing should thus be information that is of interest to and readily visible to the buyer, agent and seller of housing. This should include information on the physical environment to which inhabitants of specific neighbourhoods are subjected as well as the socio-economic status, family status, ethnicity and mobility status of neighbourhood residents, the quality and quantity of public services in the area and the taxation levels.

6.2.3 Attributes relating to the relative location and accessibility of the dwelling to other land uses

The services that flow to households through the consumption of housing are not all obtained from the structural and qualitative characteristics of the dwelling or its surrounding environment. These services are also derived from the possible interactions with other land uses that can be established from the house. The level and measure of accessibility to and interaction with various other land uses are thus factors that make important contributions to the price of housing. Accessibility or interaction attributes can be categorised by the destination land use: that is accessibility to the CBD, to the range of alternative employment opportunities, to shopping facilities, schools, recreation and other facilities (Whitbread et al., p. 196). To ensure that the description of the various determinants of house price is comprehensive, the general cost of travel (usually measured by the surrogate "distance") to the various desired (and not desired) interaction opportunities must be recorded.

Bourne (1981) states that although various studies of the determinants of the price of housing have found that the distance to the CBD still has a significant influence on the price of a dwelling and that observed prices vary with distance, the influence of the distance factor has diminished and is overwhelmed by the large contribution of the structural and qualitative characteristics of housing toward explaining variations in the price of housing (p. 163).

The price of housing, when measured per unit, is still a negative function of distance from the centre of the city. Where the analyses of house prices have been confined to properties restricted by planning legislation to be used by single families only and where total price per dwelling is used, ceteris paribus, there is an increase in the price of housing with an increasing distance from the city centre.

Against this, Carvalho et al. found in Winnipeg that location measures (distance parameters) that attempt to measure differential accessibility to various amenities did not show a significant effect on the price of housing. They also pointed out that this was in accordance with the findings of Kain and Quigley in St. Louis (p. 195).

Notwithstanding the foregoing, given the theoretical potential of the basic "trade off" model of the relationship between accessibility and house prices, it would at this stage be unwise to ignore the applicability of the accessibility of housing to different land uses toward explaining variations in the price of housing (Ball et al., p. 13) and relevant accessibility measures must be included in house price studies.

6.2.4 Attributes relating to institutional behaviour and constraints applicable to individual houses in particular and the housing market in general

The flow of housing services to households is not constant throughout the urban space. The variability in this flow is not only a result of the attributes of the previously mentioned relationships, but is also the result of the variable behaviour of the agents of supply and allocation of housing and the variable rights extended to the consumers and producers of housing by the legal system and national and local government policy within the confines of which the housing market must operate.

Attributes relating to institutional behaviour and constraints applicable to the individual dwelling in particular and the housing market in general are attributes that have generally not been included in house price studies and house price models. These attributes are of extreme importance to price fixing, and their inclusion may make the prediction of prices more difficult but definitely more effective.

The operation of the housing market is handicapped and constrained by many imperfections. The exercising of free choice by housing consumers is limited by the modus operandi of institutions; by the flow of information to consumers (which is often incomplete, frequently ambiguous and repeatedly slanted and distorted to ensure predetermined actions and results); and by legislation which is framed in accordance with the wishes and perceptions of the wealthy and politically powerful.

Included under this category of attributes are attributes that can be subdivided into **market constraints**, which refer to the relative bargaining position of buyers and sellers, length of market exposure and whether a real estate agent was used in the purchasing process; **financial constraints** which refer to the cost, type and availability of financing and credit; and **legal constraints,** which would include constraints imposed by town planning schemes, land use restrictions, national and local government policy initiatives and other legal covenants.

A conceptual model portraying the determinants of the market price of housing is set out in diagram 6.1. All attributes that influence the price paid for housing may be systematically analysed within the framework of factors relating to the property itself (which can be further subdivided into site characteristics, the structural development thereon and legal impediments applicable to the property); factors relating to the environment in which the property is situated (which comprises

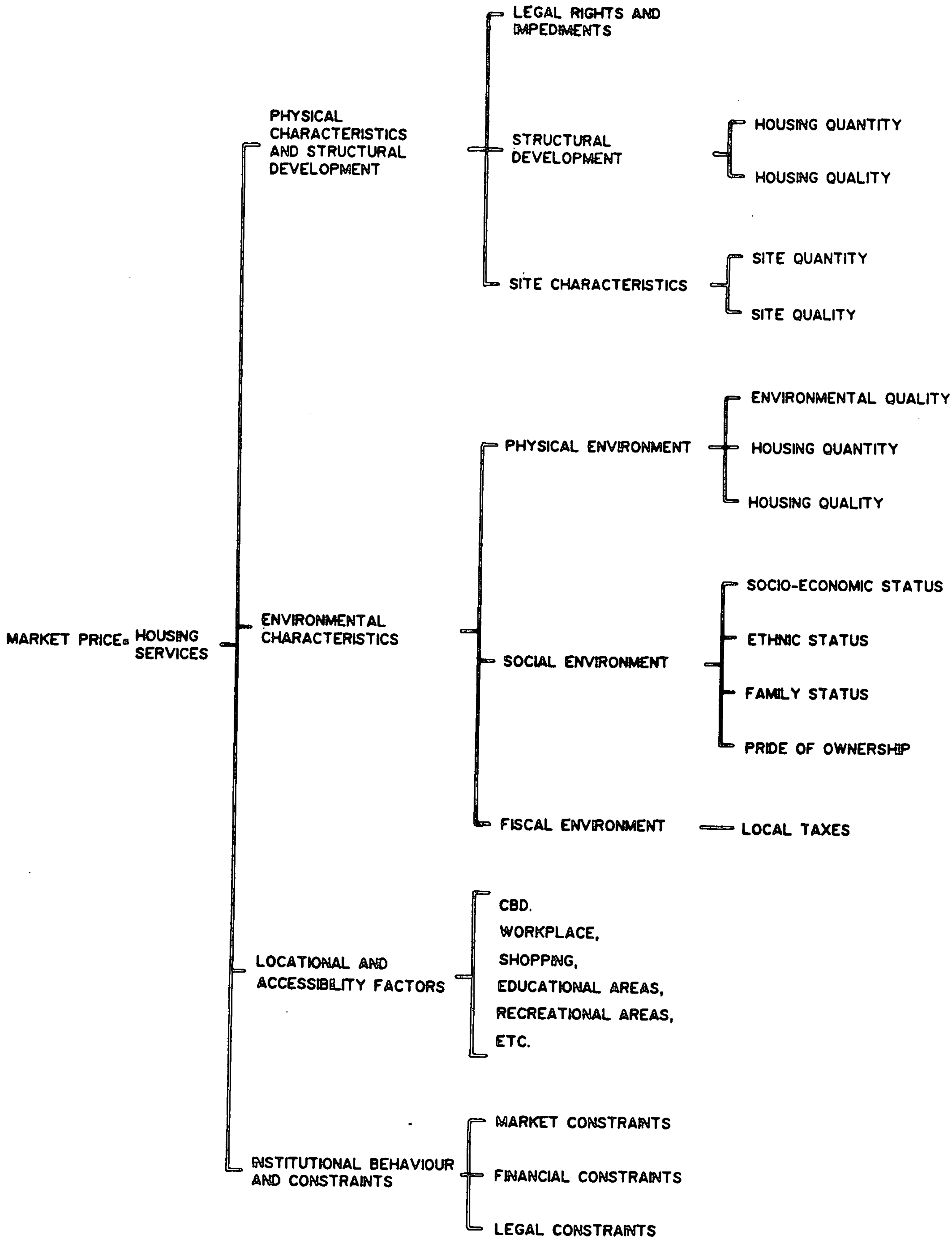

DIAGRAM 6.1 CONCEPTUAL MODEL OF THE DETERMINANTS OF HOUSE PRICES

the physical, social and fiscal environment); the accessibility of the dwelling to other land uses; and factors relating to institutional behaviour and constraints applicable to the individual house in particular and the housing market in general. Institutional behaviour and constraints comprise legal, market and financial imperfections.

6.3 Market price functions of housing

The attributes of housing are combined for each individual dwelling, in different relative proportions, quantities and quality levels, to render different housing services, also at different relative proportions, to the consumers of housing who also differ in circumstances and characteristics.

The market price of a house is a reflection of the relative desirability of that house to consumers and of the quantity and quality of housing services (these can be positive benefits or negative disadvantages) that the house provides. The desirability of the house is determined by the underlying characteristics and attributes the house possesses and the potential services these attributes provide or the consumer-wants they satisfy. Through the disaggregation of the housing commodity into its component attributes, it is possible to estimate the implicit or shadow prices associated with each component attribute. These implicit or shadow prices of attributes are obtained from the observed prices of the heterogeneous housing commodity and the specific quantity and quality levels of the characteristics associated with it. This is done by measuring the legal, site, structural, external environmental, locational and accessibility attributes of an individual house, as well as the institutional constraints applicable to that house and the housing market, and regressing the actual market price of the house on the observed set of individual characteristics and constraints. Coefficients that measure the market price of each attribute are then obtained.

The coefficients of the attributes are an estimate of the average increase or decrease in the market price owing to a change in the quantity or quality of the attribute, keeping the values of the other attributes constant. The coefficients may thus be interpreted as the average contribution each attribute makes to the market price of the house. The conclusions deduced from the equations are based on the magnitude and signs of the regression coefficients. A negative sign indicates that external diseconomies are anticipated, while a positive sign is indicative of external economies. Although the coefficients of the predictor variables may exhibit the expected signs, it is necessary that these coefficients should differ significantly from zero, at some statistically significant level, for the predictor variables to exert a significant influence on the market price of housing.

The implicit prices determined are not necessarily long-run equilibrium supply prices, but are rather sets of short-term market prices. These prices reflect the composition and location of the existing housing stock and neighbourhood components (Cao et al., p. 4; Goodman, A.C., p. 473) as well as the accessibility of the dwelling to other land uses and the influence of the constraints imposed on the operation of the housing market by the behaviour of the agents of supply and allocation of housing. It is important to note that the specific implicit prices that are the result of a study restricted to a single urban area cannot be considered invariant across time or space. There is no reason to expect that the relationship between the market price of housing and quantity and quality of the various characteristics of housing should remain constant. The estimated coefficients of the regression equation applicable in one urban area at a specific time can thus not be applied directly to other urban areas or even to the same urban area in a different time frame, without sufficient allowance being made for differences or changes in the urban environment.

The market price function of housing can be represented by the generalised model:

$P = f\,(V_1, V_2, V_3, V_4) + \mu$ where (6.1)

P = the market price of housing;

$V_1 = (X_1, X_2, \ldots, X_\alpha)$, the set of attributes relating to the legal rights and impediments, site characteristics and structural development of the dwelling;

$V_2 = (X_{\alpha+1}, X_{\alpha+2}, \ldots, X_\beta)$, the set of attributes relating to the environment in which the dwelling is situated;

$V_3 = (X_{\beta+1}, X_{\beta+2}, \ldots, X_\tau)$, the set of attributes relating to the location and accessibility of the dwelling to other land uses;

$V_4 = (X_{\tau+1}, X_{\tau+2}, \ldots, X_6)$, the set of attributes relating to institutional behaviour and constraints applicable to the dwelling and housing market; and

μ = a disturbance term.

Different households, depending on their characteristics, desires and needs, will value the attributes of housing differently and different hedonic price schedules should emerge for each household. The decisional and locational behaviour of the majority of housing consumers is, however, assumed to be sufficiently similar for average tendencies, experiences and expectations to emerge and for households of similar characteristics and circumstances to value the determinants of housing similarly. Households of vastly different characteristics and circumstances will value the attributes of housing differently.

Within a single urban area or housing market, a single preference and utility function of the attributes of housing will most probably not be the rule. There will be separate market price functions of housing for the various status (social, economic, family, ethnic, integrated) groups within such an area.

Owing to the tendency of households to perpetuate especially social status distinctions by living close to people with a similar social status, the housing market will be segmented by social status into submarkets.[1] The inhabitants of the various submarkets will intrasectorally value the attributes of housing relatively similar but intersectorally relatively different.

Although the various submarkets will not be completely isolated from each other, weak cross-price elasticities between them could result in the submarkets being characterised by independent price functions. With cross-sectional data, as used in this study, this can most easily be taken into account by estimating separate price functions for the different submarkets.

To enhance the determination of the relative values attached to the various attributes of housing, it is necessary that the housing market be disaggregated into submarkets and the relationship between the observed price of housing and the attributes of housing be calculated separately for each submarket.

The relationship noted in equation (6.1) is thus too restrictive, as it imposes uniformity on coefficients across social status groups and space.

A more general extended form of housing price functions is thus required, such as:

$$P_i = f_i \ (V_{i1}, V_{i2}, V_{i3}, V_{i4}) + \mu; \qquad (6.2)$$

i = 1, ..., q denotes submarkets q differentiated in terms of social status groupings.

[1] Submarkets and their effect on the market price of housing are discussed fully in Chapter 7.

A functional form for the relationship in equation (6.2) is not assumed at this stage. The various functional forms that have been used are generally **linear** (Berry et al., 1975, p. 30; Carvalho et al., p. 191; Richardson et al., 1974, p. 194; Walsh et al., p. 28), **log linear** (Ball et al., p. 26; Schnare et al., p. 156) and **multiplicative** (Berry, 1976, p. 401; Sumka, p. 907).

The technique of disaggregating housing into its component attributes and determining, through the application of multiple regression analysis in particular, the implicit prices associated with the component attributes, has been widely applied to improve the quality of the valuations of fixed property for tax purposes. Quigley states: "Exploitation of the hedonic relationship between rents and housing characteristics during the decade has provided a rich documentation of the dimensionality of the housing commodity, has indicated the relative importance of local externalities in the housing market and promises some practical benefits in reforming tax assessment procedures" (p. 38).

Carvalho et al. are of the opinion that "Although difficulty remains concerning the theoretically most appropriate way to interpret these so-called hedonic price functions or indices, the application of these techniques is still of immense importance ... First, as Kain and Quigley write: 'Models of this kind would be of enormous value to appraisers in estimating the value of real estate and other purposes'" (p. 191).

With regard to the acceptability of hedonic multivariate analyses in determining the relative value of the component attributes of housing, Maclennan states that there could be no real objection to the use of the techniques "if statistical explanation of house prices is required for valuation or forecasting of relative house values, ..., particularly if the empirically derived equations are relatively constant over place and time" (p. 68).

CHAPTER 7

SPATIAL DISAGGREGATION OF STUDY AREA

A major focus of discussion in urban house price studies has been whether the urban housing market is a unitary market or whether it consists of a series of submarkets. It is widely recognised by all students of urban housing that areas of differentiated housing stock as well as areas differentiated in terms of the social status of the inhabitants can be distinguished in all Westernised cities. "The well-established tendency for types of housing and households to be grouped together, however, is not sufficient to establish the existence of separate sub-markets, unless one follows the practice of defining sub-markets simply in terms of the emergence of discrete spatial groupings" (Ball et al., p. 15).

In this chapter an overview of the differences that exist among students of urban housing prices as to whether the urban housing market operates as a unitary market or a set of quasi-independent but linked submarkets, is presented. These differences are not only based on theoretical considerations but are also a result of empirical findings. Precise criteria which can be utilised to identify submarkets are also presented. Preliminary to the empirical housing price study that is to be undertaken in Chapter 8, submarkets that evolve as a result of statutory restrictions placed on the free spatial interaction of and free spatial association by all members of society are identified and delineated.

Spatially discrete areas in which the majority of households belong to one of seven social status categories, are identified. The propensity of households of a similar social status to congregate and to occupy sectors of the urban housing space to the exclusion of households of any other social status (this can be the result of the households' own doing or can be the result of the manipulative actions of the politically powerful and the rich) is used to identify and demarcate discrete social status neighbourhoods. These neighbourhoods are spatially separated sections of the larger social status areas. The seven social status areas will serve as the basic unit for the identification and testing of the existence of spatial housing submarkets that is to be undertaken in Chapter 8.

7.1 Hypothesis

The following hypotheses with regard to the existence of property submarkets as well as the spatial congregation of households of similar status are postulated:-

7.1.1 The restrictions imposed by the Group Areas Act No 77 of 1957 and the now repealed Ordinance No 29 of 1890 on the rights to the ownership and occupation of fixed property by various racial groups, give rise to the development and maintenance of property submarkets within the greater Bloemfontein area (hypothesis 1).

7.1.2 The land use restrictions imposed by the Bloemfontein Town Planning Scheme No 1 of 1954 and the Conditions of Establishment of Langenhoven Park and Extensions, effectively disaggregate the

White and Coloured submarkets resulting from the Group Areas Act, into a set of secondary submarkets (hypothesis 2).

7.1.3 The White owner-occupiers, of housing, of a similar socio-economic (social) status, will tend to cluster spatially in sectors of the White single dwelling residential submarket. This will give rise to the development of socially differentiated residential neighbourhoods within the greater Bloemfontein urban area (hypothesis 3).

7.2 Urban housing submarkets and variations in attribute prices

The urban housing market and housing submarkets are essentially economic markets. It is thus vital that these markets should be identified and measured in terms of economic considerations.

In economic terms housing submarkets have accordingly been defined as quasi-independent but linked subdivisions of the housing market. There is little interaction between the compartmentalised and unique submarkets, and the suppliers and consumers of housing interact in relative isolation within each submarket. Owing to this relative isolation, the probability of a housing unit in one submarket being substituted for a housing unit in another, is small. Within submarkets, however, any housing unit is a potential substitute for any other housing unit. This lack of intersectoral substitution of housing units as well as the independent interaction between the consumers and suppliers of housing within each submarket, results in the development of sector-specific housing attribute prices that vary across submarkets but are intrasectorally uniform.

Housing submarkets can thus be identified by the precise criteria of substitution and by the development and persistence of stable but differentiated housing attribute price schedules (Ball et al., p. 15; Bourne, 1976, p. 116; Bourne, 1981, p. 87 and p. 92; Palm, 1974, p. 218; Strazheim, 1974, p. 404).

The relatively independent intrasectoral interaction of the consumers and suppliers of housing gives rise to different structures of house prices for each group as well as to prices that do not bear a close relationship between submarkets. Accordingly a major concern that has been expressed by various researchers of house prices is the overaggregative nature of some of the estimation procedures that have been used to determine the implicit price of an attribute or a set of attributes of housing.

The major disadvantage of aggregative house price studies and the assumption of a unitary housing market in such studies is that it "limits the utility of house price studies in both a broad and a narrow sense. In the broad sense it implies that by focusing on the assumption of equilibrium prices they ignore major housing market problems. Secondly, in the narrow sense, compartmentalisation generates aggregatively imprecise implicit price estimates" (Maclennan, p. 63). Maclennan goes on and warns that price studies therefore require a pre-specification of spatial and sectoral substitution (p. 63).

Strazheim (1975), in his study of the San Francisco-Oakland area, states that the most common problem caused by overaggregation "arises as a consequence of pooling over many submarkets when the underlying parameters differ by submarket ... Pooling data over a wide geographic area implies that a single underlying price structure exists; i.e., that the price premium for quality attributes is invariant across locations ... Where neighbourhood or submarket boundaries are distinct and sharply drawn, a huge within-sample variation in prices is not taken into account by such studies" (p. 70). A.C. Goodman is also of the opinion that "although single equation models can give serviceable answers about prices, on average, separate equations may offer more insight into the important short-run behavior of markets within the metropolitan area" (p. 483).

By disaggregating the housing market by submarket and determining separate house price functions per submarket, the overall explanatory power of regression models linking house prices to attributes of the dwelling unit, the neighbourhood, the level of accessibility of the dwelling as well as the behaviour of institutions, is improved. Strazheim (1974) emphasises the necessity for and importance of the stratification, by submarket, of data in house price studies by stating that: "If the true structural coefficients of the several quality indices vary across submarkets, there is no substitute for stratifying data before estimation, ..." (p. 405). He states further that "proper geographic disaggregation in cross-section estimation must be obtained in order to obtain meaningful estimates of the spatial variation in current market prices, ..." (Strazheim, 1974, p. 406).

Palm (1974) is of the opinion that unsegmented areas might yield unreliable measures of price-attribute relationships while the disaggregation of the housing market into submarkets could illuminate local supply and demand disequilibria which might otherwise mark or distort price-attribute relationships (p. 211).

Schnare et al. summarises the view of various house price researchers, namely: "with pronounced market segmentation, traditional analyses of housing markets and, in particular, of housing market prices, become inappropriate" (p. 146). They continue by stating that "market segmentation makes an unstratified regression model inappropriate, since by definition different price structures will characterise different sectors of the housing market" (Schnare et al., p. 147).

The segmentation of the urban housing market is the result of the behavioural market practices of both the consumers and suppliers of housing. These practices place various constraints and restrictions on the operation of the housing market. This prevents the housing market from functioning as a perfectly competitive market where the demand and supply of housing are, over either the short term or in the long run, in equilibrium. Under equilibrium market conditions, the competitive bidding behaviour of the consumers of housing and the desire of the suppliers of housing to maximise selling prices, will ensure that the implicit prices of housing attributes, other than that of land, are constant over space, bundle type and social status group.

For the uniformity of attribute prices to be maintained within an urban area it is, however, necessary that any housing unit should be able to be freely, without constraint or precondition, substituted for any other housing unit within that urban area. "Unfortunately, the degree of substitution requisite to the intrametropolitan equality of attribute prices is unlikely to occur in any given market at any point in time" (Schnare et al., p. 148).

Various factors that prevent the unhindered substitutions of housing units across the urban surface have been identified, both empirically and theoretically.

Housing submarkets arise **firstly,** because of the sheer size, inherited heterogeneity and durability of the existing housing stock. A wide variety of housing types comprising different combinations of the attributes of housing can be observed across the urban surface. Within various sectors of the housing market, homogeneous housing can, however, be observed. This is a result of the historical development of the urban area and a reflection of the interaction of specific factors of supply and demand that were operative at the time of construction of specific dwellings or groups of dwellings. Owing to the durability of the housing commodity as well as the relatively high cost of adapting existing dwellings to incorporate particular attributes compared to the cost of incorporating the attributes in newly-built dwellings, the supply of housing comprising a particular combination of housing attributes is, especially in already developed areas, generally inelastic. The existing housing stock can thus not be readily adjusted to match changes in demand. The relative durability of existing housing thus prevents the substitutability of housing units and can give rise to the development of housing submarkets. The persistence of these submarkets will depend on the adaptability of the existing housing stock as well as the speed at which adaptation occurs (Ball et al., p. 15; Bourne et al., 1978, p. 12; Bourne, 1981, p. 87; Maclennan, p. 63; Strazheim, 1974, p. 404).

The **second** set of factors which can lead to housing market segmentation is attributable to the consumers of housing. Variations in the preferences of the consumers of housing for certain housing attributes can lead to the creation of housing submarkets. These varying preferences can lead to extremely diverse demands being placed on the existing housing stock. If the supply of housing with the desired attributes is at the same time highly inelastic, market disequilibrium with its attending market segmentation will result because of the mismatch between supply and demand (Bourne, 1976, p. 116; Bourne, 1981, p. 87; Strazheim, 1974, p. 404).

The characteristics of households, preferences apart, may also give rise to the segmentation of the housing market. Differences in income, social status, demographic structure, life style preferences and racial composition of households will generate different demand functions for housing. These varying demand functions can lead to the attributes of housing being valued differently by the various household groupings. Varying housing attribute price schedules of course imply the existence of housing submarkets (Ball et al., p. 20; Bourne et al., 1978, p. 12; Maclennan, p. 64; Palm, 1974, p. 216).

Further, if the demand for housing with a specific attribute or specific combination of attributes is relatively inelastic and the supply of the desired housing is not elastic, coupled with a larger demand than supply, the housing market will also be segmented into essentially independent sectors. Under these circumstances the actual and potential substitution among dwellings in different sectors of the housing market will be greatly reduced and the balancing forces of supply and demand that might otherwise equalise the implicit prices of the attributes of housing would be effectively cancelled. In the short term attribute prices will be determined by conditions unique to the separate sectors with relatively scarce components of the housing bundle attracting relatively large sectoral quasi-rents or price premiums (Bourne, 1981, p. 91; Schnare et al., p. 148).

Thirdly, the market process of supply and demand can be restricted by constraints placed on the freedom of consumers (and to a certain extent on that of producers) to enter the market in certain geographical areas. These restrictions can be of a direct and formalised nature or can be of a more subjective, less visual and more informal nature.

The most formal of these restrictions is a result of national and local government legislation and regulations. These laws and regulations can be used to reserve certain geographical areas for use by certain racial groups such as in South Africa through its Group Areas Act, or can reserve specific urban locations and areas for occupation by specific land uses through the application of town planning schemes, restrictive planning policies, growth control regulations, land use regulations and building regulations. Building regulations usually regulate the construction method and materials that can be used in the construction of housing - minimum standards are usually set. This can lead to the desirability of certain areas artificially being lowered or increased. Segmentation of the housing stock and housing market results. However, this segmentation is not the "natural" result of the interaction of supply and demand.

Subjective and less visual and formalised restrictions are also placed on the free entry of the consumers of housing into the housing market. This is done through the selective dissemination by estate agents of information on dwellings available for sale; by financial institutions through controlling access to housing finance; and through the implementation of informal racial, ethnic and social status discrimination by the inhabitants of the urban area. This last factor is a result of the tendency and desire of the wealthy and politically powerful to maintain their perceived exclusivity and to live together. Although the members of one specific racial, ethnic or status group may not wish to be restricted to living within a specific sector of the urban area, the desire of the politically powerful to maintain their exclusivity will effectively negate any desire for integration and the urban area will be segregated in terms of racial, ethnic or social considerations (Ball et al., p. 15; Bourne, 1976, p. 116; Bourne et al., 1978, p. 12; Bourne, 1981, p. 91; Palm, 1974, p. 216). The inability of all inhabitants to freely substitute their existing dwellings and the fact that certain groups are restricted to purchasing housing only within certain areas, again give rise to the segmentation of the housing market.

According to Bourne (1981): "The combined result of these restrictions is that the prices paid for certain housing, by certain types of households, will be more (the premium) than might be expected for similar housing in other areas, and the movement of households between areas would be less than one might predict" (p. 91). This of course is the typical situation that leads to the development and to the continued existence of submarkets.

The preconditions for the existence of submarkets are thus that either the demand for or supply of housing with certain attributes must be highly inelastic. Both of these conditions must, however, be coupled with a relatively larger demand for than supply of housing possessing the desired attribute or set of attributes.

However, submarkets will not emerge if 1) the demand is inelastic and the supply of housing with the preferred attributes is highly elastic; or 2) if the supply is inelastic and the demand for housing with the preferred attributes is highly elastic; or 3) if the supply of housing is larger than the demand for housing with the desired attributes. Under these situations the housing market will move to an equilibrium situation and differential implicit housing attribute prices will not accrue or be maintained (Ball et al., p. 16; Schnare et al., p. 150).

Although several researchers of urban housing markets have on theoretical grounds maintained the view that urban housing markets operate as segmented markets, consensus has not yet been reached on the criteria in terms of which submarkets are created. The criteria that have been proposed are as numerous as the number of studies that have been undertaken. Bourne (1981) presents a summary of the criteria which have been suggested by various researchers (p. 88).

However, very few of these researchers have tested whether their suggested zones of differentiated housing are in fact, in an economic sense, spatial submarkets and also whether the existence of these submarkets does indeed have an effect on the overall price of housing or on the implicit prices of the attributes of housing. Where this was undertaken, the empirical evidence was contradictory. Ball and Kirwin, and Schnare and Struyk in their studies of the Bristol and Boston housing markets respectively, found that the urban housing market operated as a unitary market while Palm and Strazheim in separate studies of the San Francisco-Oakland housing market found that the housing market was indeed segmented in terms of submarkets and that by disaggregating the housing market they significantly improved their ability to explain variations in house prices.

Notwithstanding their findings, Schnare and Struyk expressed the opinion that, given the durability and the "structural-neighbourhood bundling" of housing services, their finding that the market for single-family suburban homes essentially operated as a unitary market, was far from a foregone conclusion. Their conclusions should also not be regarded as indicative of the operational nature of the market for single-family dwellings in all westernised cities. Further research is thus needed to determine whether their findings are a relatively common or relatively isolated phenomenon (p. 164). Studies of the price of housing should thus "since submarkets are normally not known in advance, ... first determine whether or not segmentation exists, and, if it does, whether or not the resulting variations in prices are large" (Schnare et al., p. 150).

Bourne (1981) supports this view by stating that "even if it is not possible to empirically identify sub-markets on the precise, but rather narrow, criteria of substitution and independent price schedules, it is important that we identify where price differentials do exist and who pays them. The size of these differentials, and the fact that certain groups in society tend to carry the burden, are sufficient to warrant further investigation" (p. 92).

If, in any housing price study, it is assumed that the specific housing market does not operate as a unitary market but as a series of submarkets, it is imperative that the proposed disaggregation of the market should be based on the operation of that market. The submarkets that are identified must have emerged as a result of factors operative in the specific market and which would have influenced the interaction of supply and demand in that urban housing market. As the proposed subdivision of the housing market will shape and have a profound effect on the results and insights obtained from the study, these subdivisions must be behaviourally appropriate to that market. Specific criteria in terms of which submarkets are to be identified must be tailored to the needs of each study. According to Bourne (1976) these criteria should, however, emphasise social service criteria rather than strictly physical considerations (p. 122).

A major empirical problem that has characterised all housing price studies has been the delimitation of the boundaries of the submarkets (Palm, 1979, p. 107). This problem does, however, go further. In studies where variables measuring the neighbourhood quality of dwellings - this can be the physical, social or environmental quality of the neighbourhood - have been included in the housing price function, the delineation of neighbourhood units has generally been extremely subjective or has fallen back on the Enumeration District (ED) or Standard Metropolitan Statistical Area (SMSA) as basic measurement unit or basic area. The boundaries of ED's and SMSA's are used as the boundaries of the submarkets or neighbourhood units.

In housing price studies undertaken in the past, data in respect of the physical characteristics of specific dwellings have usually been collected as per individual dwelling. Information with regard to the physical and social environments of the dwellings was, however, mainly obtained from census data. A few examples of studies which have followed the research methodology are those of Ball and Kirwin in Bristol; Berry (1976) in Chicago; A.C. Goodman in New Haven; Palm (1978) in San Francisco-Oakland; Schnare and Struyk in Boston; Strazheim (1974) in San Francisco-Oakland; Sumka in various cities in North Carolina; Walsh and Stenehjem in Niskayna; Wilkinson and Archer in Leeds; and Carvalho, Hum, Sahay and Falconer in Winnipeg.

A well repeated objection to this procedure has been aired by Ball and Kirwin in stating that: "Unfortunately the census data does not contain information about all potentially relevant factors and ED's are not ideal units for this type of analysis since they are formed mainly by administrative convenience and without reference to social or physical homogeneity" (Ball *et al.*, p. 17).

Further dangers and warnings of the indiscriminate and subjective demarcation of neighbourhood boundaries are given by Walsh and Stenehjem in stating that "the delineation of neighbourhoods must involve a certain amount of subjective judgement and the results of the estimation procedure may be sensitive to arbitrary neighbourhood groupings. That is, completely reasonable differences in drawing boundaries may lead to substantial differences in the estimated values of certain borderline parcels" (p. 25). On the use of neighbourhood units in housing price studies, Wilkinson and Archer state: "The quality of the results doubtless depends very much on the approach in terms of neighbourhood units" (p. 362).

To avoid the shortcomings of census data, only de facto sampling data are used in the construction of the models in this study. In contrast to census data, which are collected for reasons other than the study of the market price of housing, the sampling data matrix has been constructed for the specific purpose of obtaining unbounded information of the characteristics of the inhabitants of the dwellings, the physical and neighbourhood characteristics of the dwellings and the dwellings' accessibility to other land uses. Any financial constraints or advantages that are applicable to the individual dwellings or inhabitants of the dwellings have also been recorded. The data that are used in this study have thus been collected with due consideration being taken of the purpose of the study - to determine the relative contribution of various factors to the market price of housing.

The neighbourhood units[1] used in the study are delimited in terms of the socio-economic status of the owner-occupiers of single-family houses. The neighbourhood units thus identify spatially homogeneous groups of households in terms of their socio-economic status. A cluster analysis is used to group the households into various categories. The spatial distribution of the groups is then used to delimit the boundaries of the neighbourhood units.

7.3 Disaggregation of the Bloemfontein property market

The Bloemfontein property market consists of a system of interrelated submarkets. Submarkets within submarkets, depending on the level of initial disaggregation and disaggregation criteria, can be distinguished. Spatially these submarkets can have well defined and exact boundaries.

7.3.1 The Group Areas Act and property submarkets

In South Africa the right to the ownership and occupation of fixed property in urban areas is controlled by the Group Areas Act, No 77 of 1957. In terms of the Act, sections of urban areas are reserved for the exclusive occupation and ownership of fixed property by various racial and ethnic groups. The racial groups that are identified by the Act are a White

[1] The grouping of houses or households is devoid of any behaviouristic considerations.

group, a Coloured group and a Native group. Additional groups are identified under the Coloured group, namely the Chinese, Indian and Cape Malay groups. The Group Areas Act has introduced racial and ethnic groupings as the major criteria for the primary disaggregation of the South African property market. This disaggregation is statutorily imposed. In 1960 T.E. Dönges, then Minister of Finance, stated that: "The Group Areas Act ... represented a serious attempt, and one that is gradually reaching fruition, to bring about social separation between the various racial groups of our multiracial land, ..." (Rosseau, foreword).

Over and above the provisions of the Group Areas Act, various ordinances which more specifically control the occupation and ownership of fixed property by specific racial groups within the various provinces, are or have been in operation in the various provinces. One such ordinance is Ordinance No 29 of 1890 of the Orange Free State that prohibited the settlement of Asians within the Orange Free State for periods of longer than two months without the necessary permission. In terms of section 1 of Chapter 33 of the Ordinance: "Geen Arabier, Chinees, Koelie of andere Aziatische kleurling zal zich met ter woon in dezen Staat kunnen vestigen, of alhier voor langer dan twee maanden kunnen vertoeven, zonder vooraf verlof van den Staatpresident te hebben verkregen" (Brockenhagen, p. 262). In terms of section 12 of Chapter 33 of the Ordinance, Cape Malays are excluded from the restriction (Brockenhagen, p. 264).

Ordinance No 29 was repealed in 1986. Its effect is however still felt as areas for the exclusive occupation by members of the

Indian group (in terms of the Group Areas Act) have not yet been demarcated within the Bloemfontein property market.

The Bloemfontein property market can thus, in 1983, be disaggregated, on racial and ethnic considerations, into three **primary** submarkets. These submarkets are locationally distinct and separated, have a continuous spatial distribution and have fixed and clearly defined boundaries. Fixed property within each submarket is reserved for the exclusive occupation and ownership by Whites, Coloureds and Blacks. The restrictions that had been placed on Asians by Ordinance No 29 in respect of the occupation and ownership of fixed property within the Orange Free State, and its only recent repeal, prevented the development of an Asian submarket within Bloemfontein.

The Black and Coloured submarkets are situated within the south-eastern quadrant of the greater Bloemfontein area. Both the Coloured and Black submarkets have a generally sectorial distribution with the apexes of the sectors nearly contiguous and situated at their nearest, linearly approximately 800 meters to the east of the boundary of the CBD and frame (refer to fig. 2).

The Coloured submarket is known as Heidedal. It comprises two areas which exclusively consist of residential development with interspersed schools, parks and small neighbourhood shopping centres and isolated retail stores. The two areas are not situated within the area of the same local authority. One area is situated within the municipal area of the Bloemfontein City Council and the other within the municipal area of the Bloemspruit Local Board. This submarket is bounded to the north by the main Free State-Natal railway line and the Corobrick brickworks, to the east by the Bloemfontein-Dewetsdorp road, to the south by agricultural small-holdings and to the west and south-west by the Black submarket.

The Black submarket also mainly comprises residential development and accompanying service activities which have a dispersed distribution and are also of an isolated nature. This submarket has a relatively extended north-south development. The submarket is bounded on its eastern boundary by the Coloured submarket, on its southern and south-eastern boundary by agricultural small-holdings and farms, on its western boundary by a 370 meter wide border strip that runs parallel to the Bloemfontein-Reddersburg road and further northwards by the Hamilton industrial area and main Bloemfontein-Cape Town railway line.

The Bloemfontein gaol is situated on the northern boundary of the submarket.

The White submarket covers the remainder of the greater Bloemfontein area.

As fixed property situated within any one of these subdivisions of the Bloemfontein property market cannot be substituted for fixed property within any of the other subdivisions, these subdivisions constitute, per definition, submarkets. Individual consumers and suppliers of fixed property (that is, consumers and suppliers who operate in their personal capacity and not as representatives of institutions or companies) can operate within only one of the submarkets. The interaction between the consumers and suppliers of fixed property is thus completely isolated within these submarkets.

7.3.2 Town planning, land use and building restrictions and property submarkets

Properties can also not, within the White and Coloured submarkets, be freely substituted. The use for which fixed properties can be utilised within these submarkets is strictly regulated by town planning and land use regulations. The result of these regulations is that the White and Coloured submarkets are further segregated, since substitution between fixed properties is restricted to those zoned for a similar land use. At a **secondary** level there thus exists, within the primary submarkets, a set of submarkets that is the result of local statutory policy restrictions that constrain the use to which fixed property can be put. The substitutability of properties is thus further constrained.

Provision is made for twenty-five and twelve land use categories in the Bloemfontein Town Planning Scheme and Conditions of Establishment of Langenhoven Park respectively. None of the twelve land use categories employed in Langenhoven Park differs radically from any used in Bloemfontein. Generally equivalent land use categories are employed by the two local authorities.

Of the twenty-five categories, nineteen reserve land for use by specific economic activities or groups of activities, two categories reserve land for future land use assignation, one category reserves land for undetermined usage, one category reserves land for occupation by a racial group (Blacks), one category reserves land to serve as a buffer zone between the White and Black and Coloured submarkets and one category (Special Usage) reserves land for occupation by individually structured usages. The "Special Usage" land use category is usually assigned on application and is tailored largely to suit the applicant's requirements. Approximately fifteen properties within Bloemfontein have been assigned this land usage.

The twenty[2] land use categories that assign properties for occupation by specific land use activities can be clustered into five broadly similar groups. The various land use categories and group clustering are set out in diagram 7.1. The five groups of broadly similar land uses are single dwelling residential land usage, multi-unit residential land usage, commercial land usage, industrial land usage and institutional land usage. Very few of the original land use categories cluster exclusively into only one of the five broad groups and most of the land use categories can be assigned to at least two of the broad groups. However, what is important to this study is that the three single-family residential usages can only be assigned to the single dwelling residential land usage group and not to any of the other groups as well.

Owing to the different requirements of the consumers and suppliers of fixed property and different perspectives from which they operate within each of the land use categories, the attributes of fixed property will be valued differently within

[2] The five categories which are excluded are the two that reserve land for future assignation, the undetermined land use, the buffer zone land usage and the land use that reserves land for occupation by a specific racial group.

LAND USE CATEGORY | LAND USE GROUP

BLOEMFONTEIN	LANGENHOVEN PARK AND EXTENSIONS	LAND USE GROUP
SPECIAL SINGLE DWELLING RESIDENTIAL	SPECIAL (SINGLE) RESIDENTIAL ERVEN	
SINGLE DWELLING RESIDENTIAL		SINGLE DWELLING RESIDEN LAND USAGE
INTERMEDIATE RESIDENTIAL		
GENERAL RESIDENTIAL	GENERAL RESIDENTIAL ERVEN	
SPECIAL BUSINESS	SPECIAL BUSINESS	MULTI-UNIT RESIDENTIA LAND USAGE
BUSINESS		
GENERAL BUSINESS		COMMERCIAL LAND USAGE
MOTOR GARAGE BUS STATION	MOTOR GARAGE, HOTEL	
GENERAL COMMERCIAL		
GENERAL INDUSTRIAL		INDUSTRIAL LAND USA
SPECIAL NOXIOUS INDUSTRIAL		
QUARRY		
SPECIAL USE		
PUBLIC BUILDINGS	SUB-STATION	
MUNICIPAL PURPOSES	LOCAL AUTHORITY	
EDUCATIONAL PURPOSES	EDUCATIONAL	
PUBLIC OPEN SPACE	PUBLIC OPEN SPACE	INSTITUTIONAL LAND USAG
PRIVATE OPEN SPACE	PRIVATE OPEN SPACE	
CEMETARY	INSTITUTIONAL (CHURCHES)	
RAILWAY PURPOSES	INSTITUTIONAL (NURSERY SCHOOL)	
BORDERSTRIP		
NON-WHITE RESIDENTIAL AREA		
PROPOSED PUBLIC OPEN SPACE		
PROPOSED PRIVATE OPEN SPACE		
UNDETERMINED USE		

DIAGRAM 7.1 CLASSIFICATION OF LAND USAGES: BLOEMFONTEIN, LANGENHOVEN PARK AND EXTENSIONS: 1983

each land use category or at the most within each land usage group. Town planning and land use restrictions will thus invariably lead to independent price schedules evolving for properties within each of the land use categories or group of categories.

The combined measures of insubstitutability and independent price schedules indicate that the various land use categories or land usage groups constitute submarkets.

The implementation of town planning and land regulations in the Bloemfontein and Langenhoven Park urban areas leads to the regional separation of urban activities and endorses the development of spatially distinct submarkets. These regulations constrain and restrict the spatial interaction space of the consumers and suppliers of fixed property under specific land uses and ensure that specific land uses are confined to specific areas within the urban surface.

The five land usage groups reveal, within the White submarket, the characteristic distributional pattern of land usages found in westernised cities. This indicates that the planning philosophy of the local planning legislator is moulded on the Western model and that he also tends to perpetuate this model but adapts it to maintain and further national and local requirements.

The majority of properties zoned for commercial usage are concentrated in and around the CBD. Various isolated clusters of properties as well as individual properties zoned for commercial usage are dispersed throughout the urban area. This is done to make provision for the establishment of commercial activities that supply goods and services required on a more regular basis - either daily or weekly. Sites of sufficient size and the necessary zoning to allow for the establishment of community shopping centres within the residential areas of Bloemfontein and Langenhoven Park have also been provided at various locations throughout the city.

Properties zoned for occupation by multi-unit residential usages (flats and town houses) are distributed concentrically around the CBD and frame. This usage zone is essentially crescent-shaped. To the north of the central business area, it extends westwards from the Transvaal-Cape railway line around the concentration of commercial usages in the central business area to again nearly abut, to the south of the central business area, on the Transvaal-Cape railway line. Owing to topographical features (Naval and Signal Hills) the concentric pattern has sectorial extensions adjacent to the Transvaal-Cape railway line as well as along Aliwal Street. The sector of institutional usages that extends westwards from the central business area to the urban fringe results in the near segmentation of the concentric distributional pattern. Various isolated clusters of properties zoned for development by multi-unit residential usages are also scattered throughout the residential section of the urban area. These clusters are mainly found within the vicinity or adjacent to the clusters of properties zoned for commercial usage. These properties are chiefly, but not necessarily, earmarked for the development of town houses.

The single dwelling residential usages also have a crescent-shaped concentric distributional pattern. This land usage is situated to the outside of the multi-unit residential usage and extends from this land usage to the urban fringe. The crescent is located to the west of the Transvaal-Cape railway line and abuts on the railway line to the north and south of the central business area. Only a small area (Erlich Park which contains 224 properties zoned for development by single residential units) is situated to the east of the Transvaal-Cape railway line. Erlich Park is located to the south of the central business area.

The crescent-shaped distributional pattern of the single dwelling residential usages is further effectively divided into a northern and southern component by the extended sectorial concentration of institutional usages.

The area of single dwelling residential usage is not characterised by the exclusive incidence of the one type of land usage. It is interspersed with usages that provide for the development of ancillary service activities of mainly an institutional nature such as schools, parks, sports fields and churches, but also activities of a commercial nature to accommodate the development of small neighbourhood shopping centres and isolated individual stores. Provision has also been made for the development of community shopping centres.

The spatial extent of the single dwelling residential land usage submarket within the primary White submarket is set out in figure

4.3 This indicates the spatial action space of the consumers and suppliers of individual and semi-detached housing units.

Vast tracts of land reserved for institutional usage can be discerned in Bloemfontein. This is due to Bloemfontein being the provincial capital of the Orange Free State, the judicial capital of South Africa and one of the major educational centres of the country. Although this usage is dispersed throughout the urban area, a concentration of the usage group is located to the west of the central business area and extends sectorially from the central business area, westwards, to the Bloemfontein municipal boundary.

Properties that have been zoned for occupation by industrial land usages are concentrated in four clusters of which three are essentially contiguous. The separated cluster is situated to the south of Fauna with the three contiguous clusters situated to the east of the commercial development and White residential areas. The industrial land usage zone, together with the extended railway marshalling yard to the north-east of the central business area, forms an effective wedge between the White residential areas on the one side and the Black and Coloured areas on the other.

In the case of Bloemfontein the distribution of land uses has been framed not only to ensure that undesirable land uses, such

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[3] Three specific land use categories are clustered in the single dwelling residential land usage group. As has been indicated in Chapter 5, the extent of the allowable usages on these properties is essentially the same and properties within the three categories are thus substitutable and it is highly unlikely that independent price schedules would evolve for each land use category.

as industrial activities, are confined to specific areas which are generally removed from residential areas, but also to ensure that the residential areas of the non-White racial groups are quite substantially and physically separated and removed from the residential areas of Whites. Further, by placing the apexes of the Coloured and Black sectorially distributed submarkets in close proximity to the central business area, the buying power of the inhabitants of these areas can be effectively utilised without necessitating the movement of Blacks or Coloureds through the residential areas reserved for occupation by Whites.

The spatially exact submarkets identified above are the result of national and local governmental legislation and regulations that restrict the free participation of the consumers and producers of fixed property and clearly define the activity spaces of the participants in each submarket.

As far as could be ascertained, a formal town planning scheme or land use regulations are not in operation within the Black submarket. However, a formal development plan, framed in terms of the Blacks (Urban Areas) Consolidation Act No 25 of 1945, on which proposed land uses are indicated, is applicable within the Black submarket. As the disaggregation of this submarket in terms of any criteria had not been researched for this study, it would be inappropriate to make any further comment in respect of this submarket.

7.4 Spatial segregation of social status classes

From the theoretical discussion in Chapters 1 and 6, as well as from the findings of Senekal in 1976, it is reasonable to expect that within the White single dwelling residential land usage submarket an orderly social geography of urban residential areas exists. Within these residential areas people and households of similar characteristics and needs reside in houses of a similar type which are clustered in specific spatial locations. This is a result, as has already been mentioned, of the desire of individuals and households to maintain bonds and to identify with other individuals and households of a similar status. By manifesting this behaviour their social exclusivity is maintained. The similarity and exclusivity of the residential neighbourhoods which are thus created and preserved also serve as a symbol of the status and status position of the inhabitants of the neighbourhood.

Factor ecologists commonly agree that in most westernised urban societies, socio-economic status is the dimension that gives rise to the largest variance between the various subgroups of urban society.

The social stratification present in industrialised communities is to a large extent based on occupations. The amount of formal training and education required to attain a specific occupational level as well as the income associated with a specific occupational level, result in the arrangement of all occupations in a status hierarchy.

In general an individual's social status, as well as that of his dependents, is determined by his position within the occupational hierarchy. The most important measures of socio-economic status (social status) are thus income, occupation and educational level (Johnston, R.J., 1971, p. 25). Berry (1973) and Timms are of a similar opinion but include the value of dwellings as a measure of socio-economic status (p. 19; p. 58). With regard to the **measures** of socio-economic status and the **factor** as such, Timms states that: "The links between each of the indicants are strong and the factor typically accounts for a major proportion of the common factor variance exhibited in urban residential differentiation" (p. 58).

Three measures of socio-economic status were used to determine whether a hierarchy of social status could be discerned among the owner-occupiers of dwellings. The three measures are also used to determine whether households of a similar social status congregate in specific locations within the urban area - thus giving rise to homogeneous neighbourhoods of social status within the White single dwelling residential usage submarket. The three measures used are the occupation, educational level and gross income plus subsidies of the head of the household. Cluster analysis was used for the abovementioned purposes. The procedure employed was procedure RELOCATE in the CLUSTAN cluster analysis programs.[4]

[4] Refer to section 5.2.2 for a brief summary of the salient features of procedure RELOCATE.

The educational level of the head of the household is measured in terms of the number of years of formal training or schooling undergone. The salient information on this variable is set out in table 7.1. No cases displayed missing values on this variable. The mean of 13,34 years indicates that a large number of heads of households have had some form of post-school training. 14,7 % of the household heads have had 10 years (standard 8) or less of formal school education, 42,4 % have completed their secondary schooling and 41,8 % have had some form of post-secondary school education. The minimum number of years spent at school was 8 years (ten respondents) while four respondents have had 21 years of formal education. None of the respondents reflected any deviant standardised scores and thus $-3,00 < z < +3,00$ for all cases.

Table 7.1 SUMMARY OF CHARACTERISTICS OF VARIABLES

Variable name (code)	EDUCH	HINCS	INCH	FINCS	INCF
Mean	13,336	27 518	23 683	33 874	30 043
Standard deviation	2,611	13 336	13 361	15 023	15 044
Median	12,000	24 816	20 815	32 043	28 000
Mode	12,000	30 000	18 000	36 000	30 000
Min. value	8,000	1 596	1 596	3 192	3 192
Max. value	21 000	150 000	150 000	151 200	151 200
Smallest z-score	-2,043	-1,94	-1,65	-1,94	-1,78
Largest z-score	2,935	9,18	9,45	9,19	8,05

EDUCH = Educational level of head of household (years)
HINCS = Gross annual income of household of head plus subsidies
INCH = Gross annual income of household head
FINCS = Gross annual income of household plus subsidies
INCF = Gross annual income of household

Four income measures were available to be used in the clustering procedure. These measures were the gross income of the head of the household with or without subsidies and the gross income of the household with or without subsidies. It was, however, decided to utilise the gross income of the head of the household plus subsidies in the clustering procedure. The reason is that in the majority of applications for credit to purchase housing, the extent of the credit is calculated on the basis of the gross income of the head of the household.

As already mentioned, a general rule that a maximum of between 25 % and 30 % of the gross income of the heads of households (housing subsidies excluded) may be allocated to mortgage redemption, is applied by the major financial institutions. To enable the mortgage to be increased, various employers subsidises the monthly redemption amount. For instance, a person who has a gross income of R3 000 a month will be allowed to allocate between R750 and R900 a month to mortgage redemption. At an interest rate of 17,50 % per annum and a 20 year redemption period, this will enable him to obtain a mortgage of between R49 800 and R59 800. By subsidising the redemption amount by R500 a month and thus increasing the redemption to between R1 250 and R1 400 a month, the amount of the mortgage can be increased to between R83 000 and R93 000.

The method of subsidisation varies among employers. It can take the form of a monthly cash payment or the employer can pay the additional monies over and above those required by a fixed lower interest rate or the employer can loan all the monies at a reduced interest rate. Whatever the method of subsidisation used, it is important that it be taken into consideration. The payment of subsidies effectively increases the gross income of the heads of households and they can thus afford houses of a higher value than their peers who do not receive a housing subsidy.

Owing to the various subsidisation schemes employed, it was decided to recalculate the housing subsidies making use of a standardising procedure. All respondents were requested to supply, as at the time of purchase of the dwelling, the amount of the bond registered against the property as well as their monthly out-of-pocket expenses to redeem the bond (housing subsidies excluded). The normal redemption amount calculated at building society interest rates, as applicable during August 1984, was calculated in respect of each respondent. The difference between the normal redemption amount and the respondent's out-of-pocket payment constitutes the standardised subsidy. These standardised subsidies were added to the gross income of the heads of households to obtain values for the variable HINCS (gross income of household head plus subsidy). The interest rates as applicable during August 1984 are set out in table 7.2.

Table 7.2 BUILDING SOCIETY INTEREST RATES: AUGUST 1984

Amount of bond (rand)	Interest rate
≤ 20 000	17,00
20 001 - 40 000	17,50
40 001 - 60 000	18,00
≥ 60 001	19,00

From table 7.1 the difference between HINCS and INCH indicates that housing subsidies on average add R3 835 p.a. to the gross income of households.

With regard to the performance of the respondents on variable HINCS it was found that one case revealed a missing value on the variable. As it was not possible to estimate the missing value and the case constituted a small proportion (0,1248 %) of the total sample, the case was deleted from the cluster analysis. The number of cases were thus reduced from 801 to 800. Nine cases (1,13 % of all cases) had z-scores in excess of + 3,00. This is to be expected. In all societies the income of households will under normal conditions not exhibit a normal distribution. This is due to a small section of society being extremely rich or earning large incomes owing to their exceptional business acumen. The nine deviant cases were thus not deleted nor were any transformations performed. Half of the respondents earned less than R2 067,83 a month (subsidies included). A breakdown of the percentage of respondents in various monthly income categories is set out in table 7.3. More than a quarter of the household heads earned between R1 501 and R2 000 a month, while more than half earned between R1 501 and R2 500 a month. Only 16,1 % of the household heads earned more than R2 500 a month. Further, on average the spouse's income contributed R6 356 per annum (the difference between FINCS and HINCS in table 7.1) to the gross income of households. This was calculated for all households. If

Table 7.3 PERCENTAGE OF HEADS OF HOUSEHOLDS PER MONTHLY INCOME CATEGORY (SUBSIDIES INCLUDED)

Monthly income (rand)	Percentage	Cumulative percentage
≤ 1 000	3,8	3,8
1 001 - 1 500	14,3	18,1
1 501 - 2 000	28,4	46,5
2 001 - 2 500	23,5	70,0
2 501 - 3 000	13,9	83,9
3 001 - 4 000	10,5	94,4
≥ 4 001	5,6	100,0

the contribution of the income of the spouse is calculated in the case of households where the spouse actually works (702 households), the spouse contributes on average R7 253 per annum to the income of the household.

The occupation of the head of the household was recorded as a discrete variable with nine categories. The nine categories, their ranking as well as the percentage of household heads in each category are recorded in table 7.4. The division is as expected with no untoward congregation of heads of households in any of the categories. None of the cases recorded a missing value on this variable. 95,2 % of household heads were employed in the labour market, 4,2 % were retired and 0,6 % were unemployed.

Table 7.4 PERCENTAGE OF HEADS OF HOUSEHOLDS PER OCCUPATION CATEGORY

Occupation type	Value	Percentage
% of household heads non-labour	1	0,6
% of household heads retired blue-collar worker	2	0,7
% of household heads retired white-collar worker	3	3,5
% of household heads labourer	4	0,2
% of household heads blue-collar worker	5	15,7
% of household heads white-collar worker	6	39,0
% of household heads with own business	7	5,9
% of household heads managers and graduates	8	19,2
% of household heads professionals	9	15,1

The 800 respondents were grouped through procedure RELOCATE into various clusters. The dissimilarity criterion used in the clustering procedure, is the euclidean sum of squares. The cluster means, as set out in table 7.5, indicated that a 7-cluster aggregation presented the best grouping of the 800 respondents. In the 5-group aggregation there is an unacceptable

Table 7.5 CLUSTER MEANS OF THREE SOCIAL STATUS INDICATORS: FIVE-, SIX- AND SEVEN- CLUSTER GROUPING

5-cluster grouping:

Indicator[a]	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
HINCS	20 234	24 360	34 829	42 449	119 669
EDUCH	11,55	16,63	12,50	17,28	15,17
OCCH[b]	5,41	8,06	6,65	8,87	6,91
n	379	151	165	99	6
% of total	47,38	18,88	20,63	12,38	0,75
Cumulative %	47,38	66,26	86,89	99,27	100,00

6-cluster grouping:

Indicator[a]	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
HINCS	17 849	23 087	24 386	39 501	42 453	119 670
EDUCH	10,46	12,24	16,05	12,43	17,30	15,17
OCCH[b]	4,78	5,81	8,07	7,14	8,80	7,80
n	128	324	150	94	98	6
% of total	16,00	40,50	18,75	11,75	12,25	0,75
Cumulative %	16,00	56,50	75,25	87,00	99,25	100,00

7-cluster grouping:

Indicator[a]	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7
HINCS	17 627	22 712	24 447	25 282	41 877	43 769	119 669
EDUCH	10,38	11,82	14,35	16,16	12,45	17,58	15,17
OCCH[b]	4,53	5,74	6,37	8,30	7,26	8,90	7,83
n	98	311	75	148	85	77	6
% of total	12,25	38,88	9,38	18,50	10,63	9,63	0,75
Cumulative %	12,25	51,13	60,51	79,01	89,64	99,27	100,00

a) The codes of the indicators are the same as used in Table 7.1.
b) OCCH = Occupational level of the head of the household
n = number of respondents

loss of detail especially with regard to respondents clustering in the lower social status categories (clusters 1 and 2). In the 5-cluster categorisation nearly two thirds (66,26 %) of the respondents group in only two clusters (clusters 1 and 2). In the 7-cluster grouping the aggregation is not as severe and 60,51 % of the respondents group into three lower social status clusters (clusters 1, 2 and 3). In the 7-cluster grouping the other 39,49 % of the respondents group into the four remaining clusters while in the 5-cluster grouping 33,74 % of the respondents group into three remaining clusters.

The seven aggregate clusters reflect a marked socio-economic status differentiation, with cluster 7 having the highest social status and the social status of the other clusters decreasing hierarchically to cluster 1 which has the lowest status. Viewed in terms of mean income, the seven clusters reveal three broad divisions. The three broad divisions consist firstly of cluster 7, secondly of clusters 5 and 6 and thirdly of clusters 1, 2, 3 and 4. The mean income of the clusters reveals intra-division similarities but large inter-division differences. The mean income of the households in cluster 7 is 179 % higher than the mean of the mean income of the households in clusters 5 and 6 (the second division). The mean income of clusters 5 and 6 is in the low R40 000's which is 90,18 % higher than the mean of the mean income of the households in clusters 1, 2, 3 and 4 (the third division). The mean incomes of clusters 1, 2, 3 and 4 decrease rather gradually from R25 282 to R17 627.

Only 21,01 % of all households group within the two high-income divisions (clusters 7 and clusters 5 and 6) with 79,01 % of the households falling within the lower income division (clusters 1, 2, 3 and 4). The extremely high income of the respondents in cluster 7 is indicative of individuals who have been extremely successful in the pursuit of their respective occupations. The rather low educational level of heads of households in cluster 5 is rather unexpected. Grouped in this cluster are heads of households who have also attained a high degree of success in their respective occupations, irrespective of their lower educational levels.

There is a high correlation between the educational level and the occupational ranking of the heads of households. The coefficient of determination $R^2 = 0,8445$. The household heads that pursue higher ranking occupations have thus had high levels of education. This is as expected.

To determine whether households of a similar social status congregate in specific areas, thus giving rise to social status neighbourhoods, the seven categories of households were transferred on to a map of the study area. Through the visual inspection of the spatial distribution of the members of the various social status groups and taking into consideration physiographic features, spatial discontinuities and natural and man-made barriers, 58 spatial zones, containing a majority of households of a similar status, were delineated. The demarcation of the proposed boundaries of the spatial zones was verified in the field. Note was especially taken of discontinuities in the housing physiognomy of zones not separated by topographical, natural or man-made barriers. The 58 zones are set out in figure 5. The means of the income, years of formal education and ranking of the occupations of the household heads in each zone are set out in table 7.6. As in the case of the demarcation of the spatial cluster analysis undertaken to demarcate spatial sampling zones, it was not possible to demarcate spatially meaningful zones that contained households of only one social status. All 58 zones thus contained a mix of households of different social status but with the majority of the households (≥ 60 %) being of one social status only.

Table 7.6 MEAN VALUES OF HINCS, EDUCH AND OCCH PER INITIAL OWNER-OCCUPIER SPATIAL CLUSTER[a])

Zone	HINCS	EDUCH	OCCH
1	36 682	13,82	7,36
2	37 871	13,77	7,55
3	24 274	13,25	5,50
4	24 677	15,33	7,50
5	40 176	14,90	8,10
6	50 737	20,00	9,00
7	67 978	14,69	7,92
8	60 119	17,13	8,13
9	37 330	13,71	7,19
10	31 437	15,33	7,67
11	24 677	12,00	6,00
12	21 976	12,33	6,17
13	21 633	11,21	5,37
14	15 740	10,13	5,50
15	15 600	10,00	6,00
16	18 476	12,00	6,00
17	18 421	10,74	6,42
18	28 461	13,14	6,29
19	41 719	17,25	8,75
20	28 273	16,00	7,67
21	25 518	14,82	7,46
22	33 544	15,33	8,17
23	28 901	14,50	7,50
24	27 647	13,80	8,00
25	26 781	13,46	6,61
26	35 139	13,62	7,39
27	35 904	13,82	7,77
28	28 193	14,33	7,27
29	37 883	12,38	6,63
30	21 808	14,20	7,10
31	27 635	13,67	6,83
32	19 790	11,55	5,73
33	18 490	11,37	5,80
34	18 254	11,80	5,50
35	41 453	14,40	6,80
36	32 418	12,60	6,60
37	25 471	13,15	5,89
38	31 405	14,25	6,83
39	31 749	15,14	7,00
40	26 466	14,67	6,83
41	26 630	14,20	7,00
42	23 069	12,17	5,67
43	30 534	14,20	6,90
44	25 411	13,34	6,08
45	22 330	11,54	5,92
46	26 703	11,92	6,67
47	20 916	11,58	5,92
48	23 801	12,78	6,09
49	29 594	13,00	6,67
50	19 429	11,67	5,33
51	21 146	11,46	6,23
52	24 071	13,26	6,39

TABLE 7.6 CONTINUED...

Zone	HINCS	EDUCH	OCCH
53	19 951	12,72	6,14
54	27 223	13,86	6,65
55	40 671	15,57	7,57
56	25 930	12,60	6,00
57	24 520	14,25	6,98
58	22 643	11,67	5,50

*) The codes of the variables are the same as used in tables 7.1 and 7.5.

To categorise the 58 zones into similar social status classes, cluster analysis through procedure RELOCATE was performed on the 58 zones. The dissimilarity criterion used was the euclidean sum of squares while the input data were the values of the variables as set out in table 7.6. After an inspection of the mean values per cluster, the number of zones per cluster and the spatial distribution of the various social status classes, it was decided that a 7-cluster division presented the best aggregation of the 58 zones. The spatial distribution of the seven social status classes is reflected in figure 6 and the mean values of the three social status indicators per social status class are set out in table 7.7.

The seven clusters clearly differentiate in terms of social status and can be ranked hierarchically in terms of social status. A problem does, however, exist in respect of the ranking of social status area 3 and social status area 4. Depending on the ranking criterion, either area 3 or area 4 can be ranked higher than the other. If the income of the head of the household is used as ranking criterion, then area 4 ranks higher than area 3. If either the educational level or occupational level of the head of the household is used as ranking criterion, then area 3 ranks higher than area 4. It would thus appear that area 4 does not have a higher social status than area 3 and vice versa. This is, however, not the case in respect of the other social status areas and the hierarchical ranking will remain the same irrespective of the ranking criterion used.

Table 7.7 MEANS OF THE THREE SOCIAL STATUS INDICATORS PER SOCIAL STATUS CLASS

Indicator[a]		Low social status		Middle social status		High social status	Very high social status
	Social status area 1 (very low)	Social status area 2 (low)	Social status area 3 (middle)	Social status area 4 (middle)	Social status area 5 (middle high)	Social status area 6 (high)	Social status area 7 (very high)
HINCS	18 946	22 341	27 696	28 617	37 396	39 027	59 611
EDUCH	11,17	12,33	14,64	13,06	13,86	15,76	17,27
OCCH	5,59	6,00	7,26	6,54	7,34	8,15	8,35
n	8	13	14	10	6	4	3
% of total	13,79	22,41	24,14	17,24	10,34	6,90	5,17
Cumulative %	13,79	36,20	60,34	77,58	87,92	94,82	100,00

[a] The codes of the indicators are the same as those used in tables 7.1, 7.5 and 7.6.
n = number of zones in social status area.

The income of heads of households does not decrease gradually from social status area 7 to area 1 but in three large jumps. The difference in income between social status areas 7 and 6 is R20 584 (the first large difference). The difference in income between areas 5 and 6 is only R1 631. The difference between the incomes of social status areas 5 and 4 is R8 779 (the second large jump) while the difference in income between social status areas 4 and 3 is only R921. The third large difference in income is between social status areas 3 and 2. The difference is R5 355. The difference in incomes between social status areas 2 and 1 is also relatively small at R3 395.

The seven social status areas can thus nominally be regrouped into four broad social status categories as indicated in table 7.7. There are small intra-category but large inter-category differences in the income of the heads of households.

The severe differences in income of the heads of households between the broader categories of social status areas are indicative of the tendency of households of similar social status to congregate in particular and separate locations within the urban area. It further also indicates that there is little underlying blending of the social status classes within the various areas, otherwise there would not have been such large differences between the mean incomes of the broader social status areas.

The income of the head of the household may be the major measure that households employ to define their community space preferences, but it is definitely not the only measure. The occupational level and educational level are also used to define similarity between households. Households of a similar income level will thus not necessarily associate and accordingly congregate in the same spatial area unless there is also a similarity in the educational and occupational level of the heads of the households. This is confirmed by the identification of especially social status areas 3 and 4; and areas 5 and 6. Although the incomes of the heads of households are rather similar in areas 5 and 6 as well as in areas 3 and 4, these areas are still identified as separate social status areas. This can only be ascribed to the differences that exist between the educational and occupational level of the heads of the households that reside in the various social status areas. The heads of households in social status area 6 have had 3,76 years of tertiary education (this implies a first degree +,76 years of tertiary education) while the heads of households in social status area 5 have only had 1,86 years of tertiary education. They have thus on average not completed a first degree. Similarly the heads of households in social status area 3 have completed 2,64 years of tertiary education (nearly a first degree) while those in social status area 4 have only completed 1,06 years of tertiary education.

There exists a strong correlation between EDUCH and OCCH. The coefficient of determination (R^2) equals 0,947. The coefficient of determination between HINCS and OCCH; and HINCS and EDUCH equals 0,777 and 0,830 respectively. Thus the higher the educational level of the head of the household, the higher the ranking of the occupation he pursues; the higher the educational level of the household head, the higher his income and lastly the higher the ranking of the occupation of the household head, the higher his income. This is as expected and in line with the results of factor ecological studies undertaken in other westernised urban societies.

The spatial distribution of the social status areas is reflected in figure 6.

Spatially the various social status areas do not display a specific distributional pattern. Only the very low social status areas (area 1) have a clear sectorial distributional pattern.

Three sectors can be distinguished. These sectors extend from the central business and multi-residential areas northwards along the main Transvaal-Cape railway line, southwards along the same railway line and westwards along the Bloemfontein-Kimberley railway line. A sectorial concentration of low social status areas (area 2) also extends southwards from the central business area in general along the Transvaal-Cape railway line with a similar concentration by the high social status areas (areas 6 and 7) extending northwards from the central business area. Except for these sectorial concentrations, the other social status areas exhibit a rather interspersed clustered distributional pattern.

All the very high and high social status areas (areas 5, 6 and 7), except for two areas situated to the west of the central business area, are concentrated to the north of the central business area. This can be ascribed to the favourable physiographic features of the northern sections of the Bloemfontein urban area as described by Senekal in 1976 (p. 52 - 93).

The north-south sectorial concentration of the very low social status areas along the Transvaal-Cape railway line is the result of the socially more powerful and well off exploiting their power by restricting the housing space of the socially less well off to residentially undesirable areas. This extended sectorial concentration serves as a buffer between the residential areas of the more well off and the negative externalities that emanate from the industrial land usages, railway line and railway marshalling yards. This of course ensures and guarantees that the social and economic welfare of the inhabitants of the higher social status areas is maintained.

As can be seen from figure 6, the various social status areas do not concentrate in one spatially continuous and distinct area but rather in spatially removed clusters or groups. Accordingly, 36 homogeneous residential subareas can be distinguished. The location of the 36 residential subareas is reflected in figure 7. These residential subareas constitute distinct neighbourhoods. Within these neighbourhoods owner-occupants, of dwellings, of a similar social status, with similar characteristics and needs, who are subject to similar positive and negative physical and social externalities, reside in houses of broadly similar types.

In each of the 36 neighbourhoods a majority of respondents of a similar social status reside. The 36 neighbourhoods form non-contiguous spatial sections of the seven social status areas identified previously. The classification of the 36 neighbourhoods into the seven social status areas is set out in table 7.8.

7.5 Conclusion and hypothesis testing

From the theoretical discussion in section 7.3 it is clear that the Bloemfontein property market consists of various submarkets. These submarkets can be identified at various levels of spatial aggregation. Submarkets within submarkets can be identified. The segmentation of the property market is the result of restrictions that are placed on the free association between the agents of the supply and allocation of housing and the consumers of housing.

These restrictions firstly restrict the occupation of fixed property by various racial groups to specific areas within the greater Bloemfontein urban area. These restrictions emanate from the provisions of the Group Areas Act and the now repealed Ordinance No 29 of 1890. These submarkets can be described as primary submarkets. The second set of statutorily imposed restrictions that leads to the development of property submarkets, is local in origin. These restrictions are imposed by the Bloemfontein Town Planning Scheme and Conditions of Establishment of Langenhoven Park and its Extensions. The land usage assigned to various properties leads to the regional separation of urban activities.

Table 7.8 SOCIAL STATUS CLASSIFICATION OF HOMOGENEOUS NEIGHBOURHOODS

Low social status		Middle social status		High social status		Very high social status
Social status area 1 (very low)	Social status area 2 (low)	Social status area 3 (middle)	Social status area 4 (middle)	Social status area 5 (middle high)	Social status area 6 (high)	Social status area 7 (very high)
8,20,30 32	2,7,12,13 22,24,27 29,35	6,9,16, 23,36	14,17,19 21,25,26 28,31	1,5,18, 33	3,11,15, 34	4,10

The prohibition on the free substitutability of all properties within the greater Bloemfontein urban area will lead to independent price schedules developing for properties within each of the land use categories or groups of categories. The development of spatially distinct property submarkets is endorsed by these town planning, land use and building restrictions.

From the theoretical discussion in sections 7.2 and 7.3, hypothesis 1 and 2 can be confidently accepted. Primary property submarkets (which are based on the segregation of the property interest activities and restriction of the property activity space of various racial groups) and secondary property submarkets (based on the segregation and restriction of the property interests and property activity space of the agents of supply and allocation and consumers of properties of different land usages) can be distinguished in the greater Bloemfontein urban area.

Within the White single dwelling residential submarket, owner-occupiers, of dwellings, of a similar social status, cluster in spatially specific subareas. The empirical evidence of the cluster analysis convincingly illustrates the existence of these groupings as well as the spatial affinity exhibited by the aq\members of a similar social status. Hypothesis 3 can thus also be confidently accepted.

At this stage of the study it is not possible empirically to maintain a view that the seven social status areas constitute housing submarkets. It will be determined in the next chapter whether the seven social status areas, which are made up of 36 non-contiguous neighbourhoods, do indeed constitute housing submarkets.

CHAPTER 8

MODEL OF HOUSE PRICE AND APPLICATION OF MODEL AS VALUATION IMPLEMENT

In this chapter it is empiririrically tested whether the White housing submarket of the overall Bloemfontein property market operates as a segmented or as a unitary market. For this purpose the general F-test is used. The general F-test compares the residual sum of squares that is obtained when a single plane is fitted to the population to that which is obtained when separate planes are fitted to subgroups of the population (the social status areas). If the two residuals are not very different, the null hypothesis that a single population plane for all social status areas combined is the true plane cannot be rejected. It can then be assumed that the owner-occupier sector of the housing market in Bloemfontein is effectively a unified market and that the unstratified model is a relatively effective tool for explaining variations in housing prices. If fitting regression planes to the social status areas separately results in a significantly smaller residual sum of squares, then the null hypothesis is rejected.

According to Schnare and Struyk, the existence of statistical differences in the estimated attribute prices is a necessary but not sufficient condition for market segmentation (p. 151). Market segmentation also implies that there should be large and marked variations in the implicit prices of housing attributes relative to the overall variation in housing prices. By comparing the standard errors of the unstratified and stratified equations, the overall efficiency of the models can be determined and compared.

If submarkets exist, the structure of the implicit price equations will be different and the strength and direction of the beta coefficients will differ for the submarkets because of the importance of different sets of variables accounting for prices in particular submarkets.

8.1 Hypothesis

The following hypotheses are tested in this chapter:-

8.1.1 H_0: A single population plane for all social status areas combined is the true plane. A geographically unstratified model of house prices thus gives better estimates of the price of housing.

H_1: Separate planes should be fitted for the seven social status areas. A geographically stratified model of house prices thus gives better estimates of the price of housing.

8.2 Choice of variables

The various independent variables used in the multiple regression analyses were selected in accordance with the conceptual framework of the determinants of house prices formulated in chapter 6 and framed schematically in diagram 6.1. The variables were selected on two levels of spatial aggregation - firstly in respect of the individual dwellings and secondly at the neighbourhood level. This is done because many of the predictor variables that are used to represent the physical, social and fiscal environment of dwellings only make sense at the neighbourhood level. The dependent variable is always expressed in terms of the individual dwellings.

To ensure that accurate estimates of the implicit prices of housing attributes as well as highly dependable estimates of market prices were obtained, it was deemed necessary to include representative measures of all the major determinant categories of market price, as predictor variables, in the housing price model. Since the physical, social and fiscal environments of housing are multidimensional concepts, it was found that they could not easily be represented by single variables or even a small number of variables. A large number of variables were required to describe adequately the external environmental factors to which an individual dwelling was subjected and which could have an influence on the price of the dwelling. Initially forty variables measuring the physical characteristics and structural development of individual dwellings, thirty-nine variables measuring the external environmental attributes of dwellings, three variables measuring locational and accessibility attributes and one variable measuring the behaviour of financial institutions were selected as predictor variables.

However, it was felt that to use thirty-nine variables to describe the external environmental attributes was excessive and statistically unwise. The use of an excessive number of predictor variables gives rise to the overspecification of the prediction equation with its concomitant problems of possibly including redundant variables. This increases the standard errors of all estimates without significantly improving the prediction of the market price of housing. The inclusion of a large number of

Table 8.1 DESCRIPTION AND CODES OF VARIABLES USED IN FACTOR ANALYSES

Description	Code
1. Socio-economic status of neighbourhoods	
Mean income of the heads of households plus subsidies in each neighbourhood (Nu)	AHINCS
Mean household income plus subsidies in each Nu	AFINCS
Mean educational level of heads of households in each Nu	AEDUCH
Mean educational level of mothers in each Nu	AEDUCM
% of the heads of households pursuing professional occupations in each Nu	APPROF
% of the heads of households managers and graduates in each Nu	APMAN
% of the heads of households with own business in each Nu	APOWN
% of the heads of households pursuing white-collar occupations in each Nu	APWHI
% of the heads of households pursuing blue-collar occupations in each Nu	APBLUE
% of mothers pursuing professional occupations in each Nu	APMPRO
% of mothers managers and graduates in each Nu	APMMAN
% of mothers pursuing white collar occupations in each Nu	APMWHI
% of mothers not in the labour market in each Nu	APMNON
2. Pride of ownership of neighbourhood inhabitants	
% of dwellings in a new condition in each Nu	ANCON
% of dwellings in a good condition in each Nu	AGCON
% of dwellings in an average condition in each Nu	AACON
% of dwellings requiring repairs in each Nu	ARCON
% of dwellings in a dilapidated condition in each Nu	ADCON
% of dwellings with no garden development in each Nu	ANOGAR
% of dwellings with weak garden development in each Nu	AWGARD
% of dwellings with good (new) garden development in each Nu	AGNGAR
3. Housing quantity of neighbourhoods	
Mean total area of dwellings in each Nu	ACAREA
% of dwellings with one bathroom in each Nu	ABATH1
% of dwellings with one or less garages in each Nu	AGARA1
% of dwellings with four or less living rooms in each Nu	AROOM4
% of dwellings with seven or more living rooms in each Nu	AROOM7
Mean age (months) of dwellings in each Nu	ADATE
Mean netto lot size in each Nu	ANLSZ
Mean price of dwellings in each Nu	APRICE
Mean annual municipal taxes in each Nu	ATMT84
4. Housing quality of neighbourhoods	
% of dwellings scheme houses in each Nu	ASCHEM
% of dwellings altered scheme houses in each Nu	AASCHE
% of dwellings standard houses in each Nu	ASTAN
% of dwellings architecturally designed houses in each Nu	AARCH

variables to typify the environmental characteristics of dwellings will also most probably give rise to multicollinearity. This will result because of the interrelated nature of the physical, social and fiscal environment of dwellings.

To eliminate the problems of overspecification and the distorting influence of multicollinearity, while still incorporating meaningful proxies of the environmental attributes of housing, thirty-four of the thirty-nine environmental attributes were reduced to a smaller number of uncorrelated dimensions through the principal component solution of factor analysis. The incorporation of common factors in the regression analyses also reflects more accurately actual market behaviour in that the consumers of housing and agents of supply and allocation of housing evaluate the character of the neighbourhood in which a dwelling is situated, in terms of a few broad constructs rather than by numerous individual items.

8.2.1 Extraction of factors

Separate factor analyses were undertaken in respect of the socio-economic status, pride of ownership, housing quantity and housing quality of neighbourhoods. This was done to ensure that dimensions that corresponded to these categories, would emerge.

The thirty-four variables that were factor-analysed are set out in table 8.1. In order to obtain unbiased estimates of the prevalent values of the environmental attributes per neighbourhood, it was decided to base the calculation of the means and percentages on a minimum of three respondents per neighbourhood. As there was only one respondent located within neighbourhood 12, this respondent and neighbourhood were deleted from any further factor analysis or multiple regression analyses. Data in respect of a specific neighbourhood were only assigned to respondents located within that neighbourhood. The factor

Table 8.2 SUMMARY STATISTICS OF VARIABLES USED IN FACTOR ANALYSES[a]

Group	Code	Mean	Standard deviation
Socio-economic status of neighbourhood	AHINCS	27 541,609	8 636,141
	AFINCS	33 904,744	8 931,546
	AEDUCH	13,338	1,308
	AEDUCM	12,674	0,836
	APPROF	15,125	15,136
	APMAN	19,250	11,210
	APOWN	6,000	7,990
	APWHI	39,375	15,159
	APBLUE	16,000	14,043
	APMPRO	2,250	3,835
	APMMAN	10,250	6,080
	APMWHI	39,125	13,767
	APMNON	35,500	14,356
Pride of ownership of neighbourhoods	ANCON	35,625	36,891
	AGCON	25,875	15,502
	AACON	15,875	12,983
	ARCON	20,875	18,330
	ADCON	1,000	1,569
	ANOGAR	33,625	35,488
	AWGARD	27,125	17,505
	AGNGAR	8,000	7,200
Housing quantity of neighbourhoods	ACAREA	195,118	39,691
	ABATHI	21,750	26,579
	AGARAI	48,000	27,187
	AROOM4	12,375	15,853
	AROOM7	28,000	23,678
	ADATE	146,475	149,642
	ANLSZ	1 226,213	295,388
	APRICE	73 308,696	19 908,597
	ATHT84	465,094	136,348
Housing quality of neighbourhoods	ASCHEM	4,250	9,010
	AASCHE	9,375	18,247
	ASTAN	75,500	28,095
	AARCH	10,125	19,246

[a] The codes of the variables are explained in Table 8.1

analysis in respect of socio-economic status was thus performed on eight hundred observations on thirteen variables and in respect of pride of ownership, housing quantity and housing quality also on eight hundred observations but on eight, nine and four variables respectively.

An inspection of the correlation matrices set out in tables 8.3 (socio-economic status), 8.4 (pride of ownership), 8.5 (housing quantity) and 8.6 (housing quality), revealed that more than two thirds of the coefficients in each matrix were in excess of 0,3 in absolute value. The percentage of coefficients in coefficient classes as well as cumulative percentages are indicated in table 8.7. All variables, with the exception of AGNGAR, ADATE and AARCH have correlations in excess of $|0,5|$ with at least one of the other variables in the respective sets. AGNGAR, ADATE and ARCH do, however, have at least one coefficient > $|0,4|$. All this indicates that the variables are interrelated and that patterns in responses could be anticipated.

Scree diagrams were used as principal procedure to determine how many factors should be retained. Two additional retention criteria were employed. These were firstly that all retained factors should have eigenvalues > 1,00000 and secondly that the eigenvalues retained should cumulatively account for more than 75 % of the total variance in the sample correlation matrix **(R)**.

The scree diagram in respect of socio-economic status of neighbourhoods (diagram 8.1) indicated that four factors should be retained. All factors that were retained had eigenvalues >1,00000 while the four eigenvalues cumulatively explained 83,7 %

Table 8.3 CORRELATION MATRIX OF VARIABLES MEASURING THE SOCIO-ECONOMIC STATUS OF NEIGHBOURHOODS[a]

	AHINCS	AFINCS	AEDUCH	AEDUCH	APPROF	APMAN	APOWN	APWHI	APBLUE	APMPRO	APMMAN	APMWHI	APMNON
AHINCS	1,00000												
AFINCS	0,97192	1,00000											
AEDUCH	0,68811	0,72236	1,00000										
AEDUCH	0,52953	0,58787	0,88971	1,00000									
APPROF	0,73378	0,73912	0,86094	0,72841	1,00000								
APMAN	0,27762	0,28219	0,46547	0,41251	0,18968	1,00000							
APOWN	0,64151	0,57249	0,24584	0,13119	0,35576	0,22696	1,00000						
APWHI	-0,67914	-0,62783	-0,65274	-0,47454	-0,77632	-0,42799	-0,57044	1,00000					
APBLUE	-0,60048	-0,62193	-0,70716	-0,67632	-0,54658	-0,64273	-0,43751	0,39312	1,00000				
APMPRO	0,25168	0,34197	0,51707	0,55928	0,51409	0,02457	-0,05686	-0,30816	-0,20016	1,00000			
APMMAN	0,11463	0,17643	0,42499	0,55065	0,16282	0,43302	-0,07035	-0,10316	-0,34374	0,06385	1,00000		
APMWHI	-0,41749	-0,33594	-0,50571	-0,49486	-0,45541	-0,45762	-0,23293	0,57424	0,45737	-0,25578	-0,31908	1,00000	
APMNON	0,48603	0,34707	0,25854	0,20131	0,35479	0,29970	0,35154	-0,50640	-0,41236	-0,00313	-0,10324	-0,72866	1,00000

[a] The codes of the variables are the same as those used in table 8.1

Table 8.4 CORRELATION MATRIX OF VARIABLES MEASURING THE PRIDE OF OWNERSHIP OF NEIGHBOURHOODS[a]

	ANCON	AGCON	AACON	ARCON	ADCON	ANOGAR	AWGARD	AGNGAR
ANCON	1,00000							
AGCON	-0,73623	1,00000						
AACON	-0,79414	0,44615	1,00000					
ARCON	-0,82238	0,32805	0,51773	1,00000				
ADCON	-0,46560	0,15702	0,32073	0,51201	1,00000			
ANOGAR	0,95040	-0,76674	-0,75769	-0,72400	-0,45021	1,00000		
AWGARD	-0,84514	0,50534	0,65190	0,80867	0,36607	-0,75997	1,00000	
AGNGAR	-0,08747	0,35474	-0,03893	-0,10399	-0,00892	-0,16790	0,11751	1,00000

a) The codes of the variables are the same as those used in table 8.1

Table 8.5 CORRELATION MATRIX OF THE VARIABLES MEASURING THE HOUSING QUANTITY OF NEIGHBOURHOODS[a]

	ACAREA	ABATH1	AGARA1	AROOM4	AROOM7	ADATE	ANLSZ	APRICE	ATMTB4
ACAREA	1,00000								
ABATH1	-0,66456	1,00000							
AGARA1	-0,66663	0,75481	1,00000						
AROOM4	-0,73267	0,79678	0,71818	1,00000					
AROOM7	0,89354	-0,61019	-0,67436	-0,64939	1,00000				
ADATE	0,11151	0,47971	0,46231	0,09118	0,05514	1,00000			
ANLSZ	0,81977	-0,63805	-0,57822	-0,55261	0,74546	-0,05468	1,00000		
APRICE	0,87533	-0,71668	-0,74286	-0,61543	0,84960	-0,24454	0,85776	1,00000	
ATMTB4	0,82728	-0,77157	-0,71539	-0,60644	0,77235	-0,32677	0,88698	0,95768	1,00000

a) The codes of the variables are the same as those used in table 8.1

Table 8.6 CORRELATION MATRIX OF VARIABLES MEASURING THE HOUSING QUALITY OF NEIGHBOURHOODS[a]

	ASCHEM	AASCHE	ASTAN	AARCH
ASCHEM	1,00000			
AASCHE	0,67334	1,00000		
ASTAN	-0,63391	-0,71697	1,00000	
AARCH	-0,21289	-0,23130	-0,45727	1,00000

a) The codes of the variables are the same as those used in table 8.1

Table 8.7 FREQUENCIES, PERCENTAGE AND CUMULATIVE PERCENTAGE OF CORRELATION COEFFICIENTS IN VARIOUS COEFFICIENT CLASSES

Coefficient class (absolute value)	Socio-economic status			Pride of ownership			Housing quantity			Housing quality		
	f	%	CUM.%	f	%	CUM.%	f	%	CUM.%	f	%	CUM.%
>,90000	1	1,28	1,28	1	3,57	3,57	-	-	-	-	-	-
,80000 -,89999	1	2,56	3,85	3	10,71	14,29	8	22,22	22,22	-	-	-
,70000 -,79999	7	8,97	12,82	6	21,43	35,71	10	27,78	50,00	1	16,67	16,67
,60000 -,69999	9	11,54	24,36	1	3,57	39,29	8	22,22	72,22	2	33,33	50,00
,50000 -,59999	12	15,38	39,74	3	10,71	50,00	2	5,56	77,78	-	-	50,00
,40000 -,49999	14	17,95	57,69	3	10,71	60,71	2	5,56	83,33	1	16,67	66,67
,30000 -,39999	10	12,82	70,51	4	14,29	75,00	1	2,78	86,11	-	-	66,67
<,30000	23	29,49	100,00	7	25,00	100,00	5	13,89	100,00	2	33,33	100,00

Table 8.8 EIGENVALUES AND CUMULATIVE PERCENTAGES OF TOTAL VARIANCE EXPLAINED

Principal component	Socio-economic status		Pride of ownership		Housing quantity		Housing quality	
	Eigenvalue	Cum. %	Eigenvalue	Cum. %	Eigenvalue	Cum. %	Eigenvalue	Cum. %
1	6,51042	50,1	4,77293	59,7	6,25112	69,5	2,35011	58,8
2	1,79502	63,9	1,28789	75,8	1,33180	84,3	1,31163	91,5
3	1,48502	75,3	0,79238	85,7	0,66649	91,7	0,33319	99,9
4	1,08581	83,7	0,51955	92,2	0,33348	95,4	0,00507	100,0
5	0,57403	88,1	0,42091	97,4	0,18733	97,4		
6	0,54811	92,3	0,15254	99,3	0,10795	98,6		
7	0,39120	95,3	0,05311	100,0	0,08015	99,5		
8	0,30858	97,7	0,00069	100,0	0,02654	99,8		
9	0,11958	98,6			0,01514	100,0		
10	0,10502	99,4						
11	0,04457	99,7						
12	0,02509	99,9						
13	0,00753	100,0						

of the total variance in **R** (from table 8.8). All the factors that were not retained had eigenvalues < 1,00000.

The scree diagram in respect of pride of ownership (diagram 8.2) did not exhibit a very clear "elbow" in the curve and thus it was not very clearly illustrated how many factors should be retained. Two or three factors could be retained. In this instance the secondary procedures were used as retention criteria. Only the first two factors had eigenvalues > 1,00000 while they explained 75,8 % of the total variance in **R**. Two factors were thus retained. The factors that were not retained for all had eigenvalues < 1,00000. Scree diagrams in respect of housing quantity and housing quality, diagrams 8.3 and 8.4 respectively, clearly indicated that two factors should be retained in each instance. The eigenvalues of the retained factors were all > 1,00000 while all of those not retained had eigenvalues < 1,00000. The percentage of the total variance in **R** explained by two factors is 84,3 % in respect of housing quantity and 91,5 % in respect of housing quality (from table 8.8).

To enhance the interpretability of the retained factors, varimax rotation was performed on the initial factor loading matrices. The rotated factor loading matrices for each set of variables are shown in tables 8.9 (socio-economic status of neighbourhoods), 8.10 (pride of ownership of neighbourhood residents), 8.11 (housing quantity of neighbourhoods) and 8.12 (housing quality of neighbourhoods). Factor loadings < 0,5 in absolute value are not shown.

8.2.2 Factor interpretation

8.2.2.1 Socio-economic status of neighbourhoods

Factor 1: The first factor with an eigenvalue of 6,51042 explains 50,1 % of the total variance between factors. This factor identifies positively neighbourhoods where the average income of the heads of households and total household income are high (AHINCS, loading 0,85843; AFINCS, loading 0,8300). The heads of households are economically successfully self-employed (APOWN, loading 0,85806) or are professionals (APPROF, loading 0,55157). This factor is an **income and occupational status** scale (INOC). High incomes and high-status occupations define one end of the

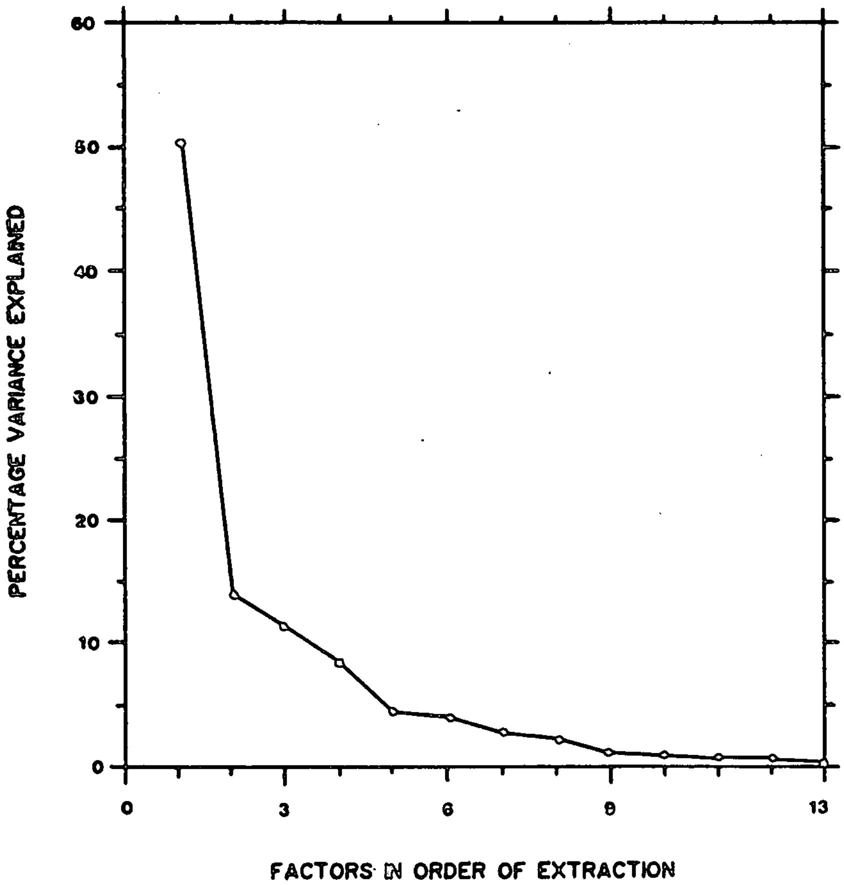


DIAGRAM 8.1 CATTEL'S SCREE TEST: SOCIO-ECONOMIC STATUS

scale and white-collar and blue-collar workers the other (APWHI, loading -0,58861; APBLUE, loading -0,51741). Respondents with high factor scores will reside in neighbourhoods in which a larger than average proportion of the households have high incomes and heads of households pursue high-status occupations.

Factor 2: This factor with an eigenvalue of 1,79502 explains 13,8 % of the variance between factors. The factor has high positive loadings on four variables, which identifies this factor as an indicator of social status based on the **occupational and educational levels** (OCED) of heads of households and their spouses. Respondents with high scores on this factor will live in neighbourhoods of which both the heads of households and spouses pursue extremely high-status occupations (APMPRO, loading 0,87985; APPROF, loading 0,71222) with both having high levels of education (AEDUCM, loading 0,70432; AEDUCH, loading 0,68463). Although the residents of these neighbourhoods would most probably have large incomes, the income variables did not emerge. This can indicate that high occupational and educational levels do not necessarily quarantee very high incomes and that the successfully self-employed probably have the highest incomes.

Factor 3: This factor with an eigenvalue of 1,48502 explains 11,4 % of the variance between factors. The percentage of mothers and heads of households occupying managerial positions and mothers with high educational levels display the same sign (positive) while blue-collar workers display the opposite sign. This factor is a type of occupational status scale with managers (APMMAN, loading 0,84690; APMAN, loading 0,76299) and educated mothers (AEDUCM, loading 0,57511) defining one end of the scale

Table 8.9 SORTED FACTOR LOADING MATRIX OF FACTORS RETAINED: SOCIO-ECONOMIC STATUS[a]

Sorted factor loadings															
Factor 1				Factor 2				Factor 3				Factor 4			
Variable	+	Variable	-	Variable	+	Variable	-	Variable	+	Variable	-	Variable	+	Variable	-
AHINCS	0,85843	APWHI	-0,58861	APMPRO	0,87985			APMMAN	0,84690	APBLUE	-0,62790	APMNON	0,89661	APMWHI	-0,83959
APOWN	0,85806	APBLUE	-0,51741	APPROF	0,71222			APMAN	0,76299						
AFINCS	0,83000			AEDUCM	0,70432			AEDUCM	0,57511						
APPROF	0,55157			AEDUCH	0,68463										
Eigenvalue			6,51042				1,79502				1,48502				1,08581
% of variance			50,1				13,8				11,4				8,4
Cumulative %			50,1				63,9				75,3				83,7

a) The codes of the variables are the same as those use in table 8.1 and only factor loadings -0,5 > F > 0,5 are displayed.

and blue-collar workers the other end (APBLUE, loading -0,62790). This factor can be labelled an indicator of **middle-high occupational status** (MHOC). Residents with negative scores will be located in neighbourhoods where blue-collar workers form a larger than average proportion of the occupants. Large positive factor scores will be assigned to respondents living in neighbourhoods where the mothers have high levels of education and where the mothers and heads of households occupy middle-high status occupations.

The non-emergence of the educational variable for heads of households is of interest. This may imply that some form of discrimination is applied against women and that in order for women to compete with men for similar occupations, a higher educational qualification is expected. Alternatively it may imply that because of family commitments, mothers have not been able to utilise advancement possibilities to their fullest extent or maybe have taken a break in their careers for pregnancies and to assist in the raising of their children during their younger years.

Factor 4: This factor with an eigenvalue of 1,08581 explains 8,4 % of the variance between factors. This factor is a construct that differentiates between neighbourhoods where a large percentage of the mothers are not active within the formal labour market (APMNON, loading 0,89661) and neighbourhoods where a large percentage of mothers participate in the formal labour market (APMWHI, loading -0,83959). This factor can be labelled an indicator of **occupational participation of mothers** (OPM).

Table 8.10 SORTED FACTOR LOADING MATRIX OF THE FACTORS RETAINED: PRIDE OF OWNERSHIP[a]

		Sorted factor loadings					
	Factor 1				Factor 2		
Variable	+	Variable	-	Variable	+	Variable	-
ARCON	0,89080	ANCON	-0,94911	AGNGAR	0,85747		
AWGARD	0,85758	ANOGAR	-0,88618	AGCON	0,71083		
AACON	0,79006						
ADCON	0,60661						
AGCON	0,52663						
Eigenvalue			4,77293				1,28789
% of variance			59,7				16,1
Cumulative %			59,7				75,8

[a] The codes of the variables are the same as those used in Table 8.1 and only factor loadings -0,5 > F > 0,5 are displayed.

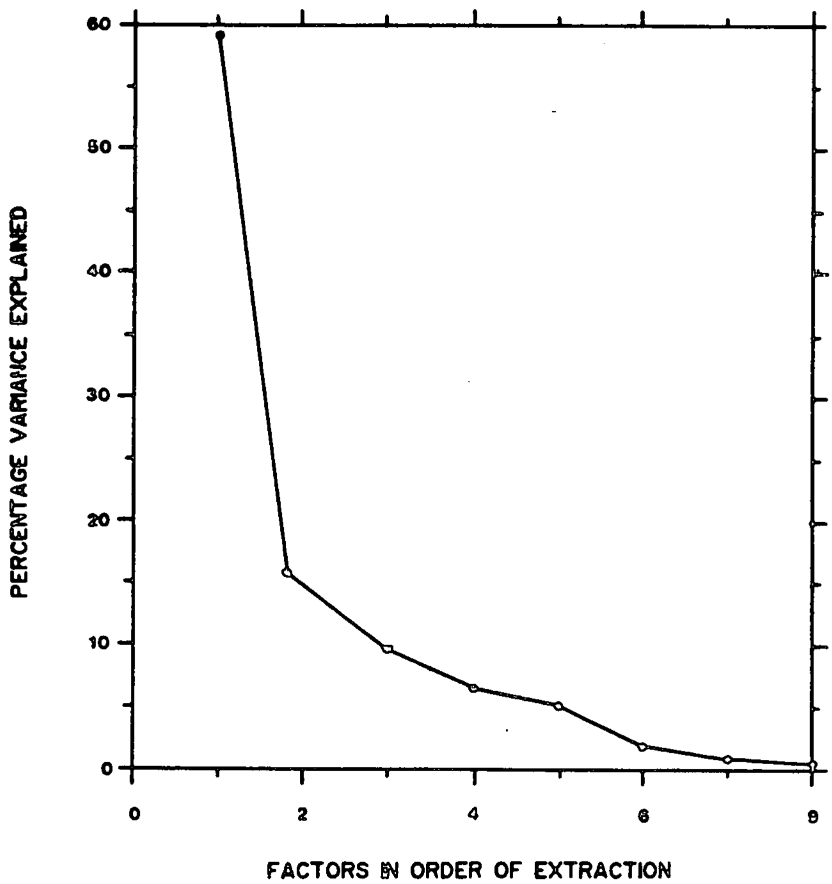


DIAGRAM 8.2 CATTEL'S SCREE TEST: PRIDE OF OWNERSHIP

8.2.2.2 Pride of ownership exhibited by residents of neighbourhoods

Factor 1: This factor with an eigenvalue of 4,77293 explains 59,7 % of the variance between this set of factors. This factor is a dimension that differentiates between recently constructed dwellings where no garden development has yet taken place (ANCON, loading -0,94911; ANOGAR, loading -0,88618) and dwellings that are in a weak state of repair with weak garden development (ARCON, loading 0,89080; AWGARD, loading 0,85758). This factor cannot be described as an indicator of pride of ownership. The high loadings on dwellings in an average condition, dwellings in a dilapidated condition and dwellings in a good condition prevent such a typology. It is rather a construct that identifies negatively neighbourhoods characterised by **new housing development**(NHD). Of the 800 dwellings that formed the sample, 218 dwellings (27,2 %) were newly constructed and 257 dwellings (32,1 %) were ≤ 12 months old (the 257 dwellings include the 218 dwellings).

Factor 2: This factor with an eigenvalue of 1,28789 explains 16,1 % of the variance between factors. It identifies neighbourhoods in which a larger than normal proportion of the gardens are in a good (new) condition (AGNGAR, loading 0,85747) and the dwellings are in a good condition (AGCON, loading, 0,71083). This factor can be typified as an indicator of **pride of ownership** (PROW).

Table 8.11 SORTED FACTOR LOADING MATRIX OF THE FACTORS RETAINED: HOUSING QUANTITY[a]

			Sorted factor loadings				
	Factor 1				Factor 2		
Variable	+	Variable	-	Variable	+	Variable	-
ACAREA	0,98037	AROOM4	-0,75916	ADATE	0,97138		
APRICE	0,91519	ABATH1	-0,70654	ABATH1	0,58087		
AROOM7	0,90816	AGARA1	-0,69861	AGARA1	0,55814		
ANLSZ	0,89114						
ATMT84	0,87929						
Eigenvalue			6,25112				1,33180
% of variance			69,50				14,8
Cumulative %			69,50				84,30

[a] The codes of the variables are the same as those used in Table 8.1 and only factor loadings -0,5 > F > 0,5 are displayed.

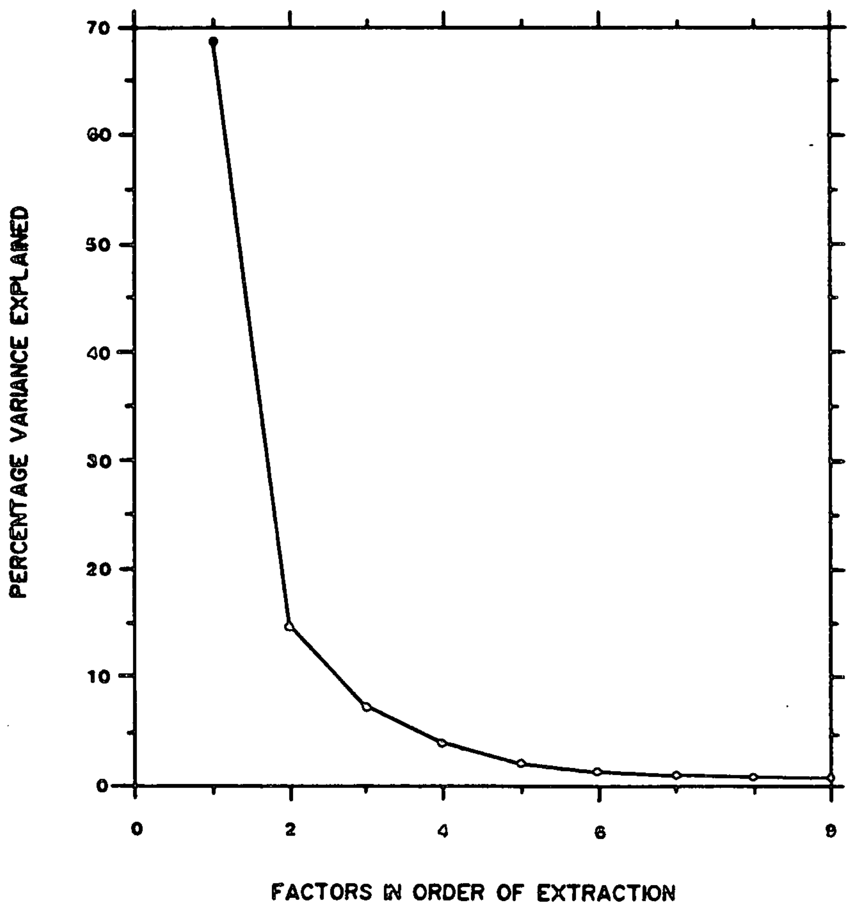


DIAGRAM 8.3 CATTEL'S SCREE TEST: HOUSING QUANTITY

8.2.2.3 Housing quantity of neighbourhoods

Factor 1: The first factor with an eigenvalue of 6,25112 explains 69,5 % of the variance between the factors. The factor exhibits high loadings on eight variables. Of these, area of housing, market price, large number of rooms, nett lot size and annual municipal tax exhibit the same sign (positive), while one or less garages, one bathroom and houses with four or less living rooms display the opposite sign. This factor is a construct that is indicative of **housing and site quantity** (HSQT). Respondents with high positive scores on this factor will be located in neighbourhoods characterised by large dwellings (ACAREA, loading 0,98037, AROOM7, loading 0,90816) situated on large lots (ANLSZ, loading 0,89114) that demand high prices (APRICE, loading 0,91519) and have been valued accordingly (ATMT84, loading 0,87929). Respondents with low (negative) scores on this factor will be located in neighbourhoods characterised by small dwellings (AROOM4, loading -0,75916) that only have basic or few amenities (ABATH 1, loading -0,70654; AGARA 1, loading -0,55814).

Factor 2: This factor with an eigenvalue of 1,33180 explains 14,8 % of the variance between the factors. This factor is an indicator of the **age of housing stock** (AGED). There is a positive correlation between the average age of the dwelling stock of a neighbourhood and the factor score that will be assigned to the respondents who are located within the neighbourhood (ADATE, loading 0,97138). The older dwellings will also contain only basic amenities (ABATH1, loading 0,58087; AGARA1, loading 0,55814).

Table 8.12 SORTED FACTOR LOADING MATRIX OF THE FACTORS RETAINED: HOUSING QUALITY[a]

			Sorted factor loadings				
	Factor 1				Factor 2		
Variable	+	Variable	-	Variable	+	Variable	-
AASCHE	0,92246	ASTAN	-0,82424	AARCH	0,99154	ASTAN	-0,56152
ASCHEM	0,88884						
Eigenvalue			2,35011				1,31163
% of variance			58,8				32,8
Cummulative variance			58,8				91,5

[a] The codes of the variables are the same as those used in Table 8.1 and only factor loadings -0,5 > F > 0,5 are displayed.

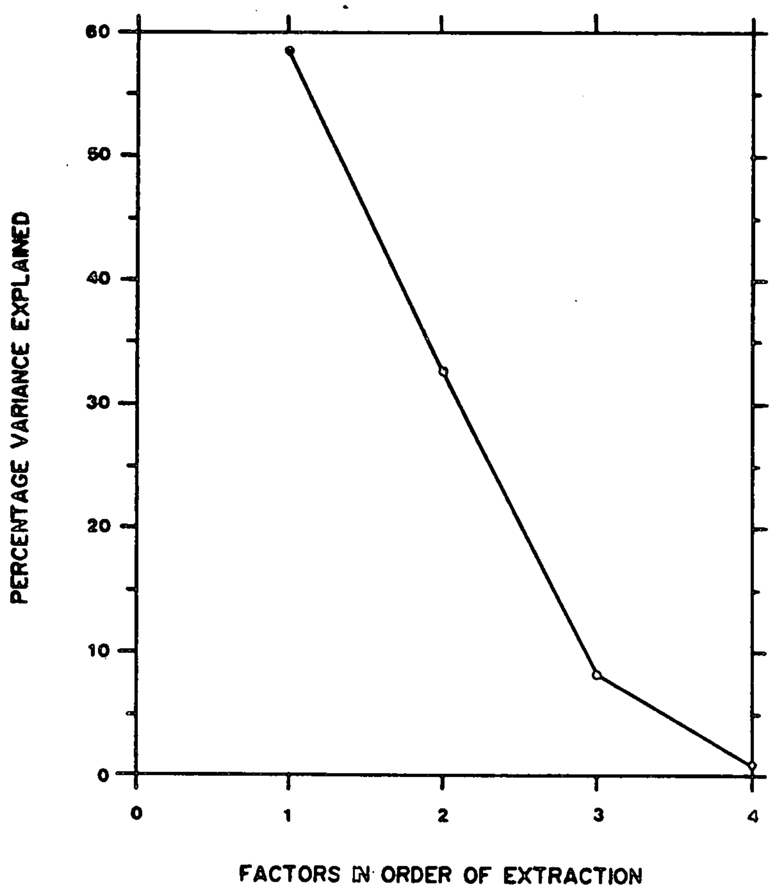


DIAGRAM 8.4 CATTEL'S SCREE TEST: HOUSING QUALITY

8.2.2.4 Housing quality of neighbourhoods

The two extracted factors are both housing status indicators. The first factor is an indicator of **low-quality housing** (LQLH) and the second factor of **high-quality architecturally designed housing** (HQLAH). The first factor scores high on three variables: percentages of dwellings in the neighbourhood that are altered scheme housing (AASCHE, loading 0,92246), are unaltered scheme housing (ASCHEM, loading 0,88884) and are standard housing (ASTAN, loading -0,82424). Respondents with high positive scores on this factor will be situated in neighbourhoods characterised by low-quality housing. Respondents located in neighbourhoods characterised by average quality housing, will have high negative scores on this factor. The second factor has a high positive loading on architecturally designed dwellings (AARCH, loading 0,99154) and a high negative loading on average housing (ASTAN, loading -0,56152). Respondents with high scores on this factor will be situated in neighbourhoods characterised by high-quality architecturally designed dwellings while negative factor scores will be assigned to respondents located in neighbourhoods characterised by housing of an average quality.

8.2.3 Factor interrelationships

In view of the underlying dimensions of the retained factors, the grouping tendency of similar households and the tendency that housing is used as a symbol of social status, it was expected that patterns of correlations between some of the factors would emerge. The matrix of correlations between the various factors is set out in table 8.13. Neighbourhoods in which households with

Table 8.13 FACTOR CORRELATION MATRIX [a]

		Socio-economic status				Pride of ownership		Housing quantity		Housing quality	
		INOC	OCED	MHOC	OPM	NHD	PROW	HLQT	AGED	LQLH	HQLAH
	INOC	1,0000									
Socio-	OCED	,0000	1,0000								
economic	MHOC	,0000	,0000	1,0000							
status	OPM	,0000	,0000	,0000	1,0000						
Pride of	NHD	,1085	-,2347	-,4298	,1574	1,0000					
ownership	PROW	,2627	-,2477	,1753	,1893	,0000	1,0000				
Housing	HLQT	,7126	,2438	,2556	,3757	-,0476	,2040	1,0000			
quantity	AGED	,2321	-,1502	-,3673	,0716	,7929	-,0704	,0000	1,0000		
Housing	LQLH	-,2144	-,2920	-,5011	-,1783	,4708	,0839	-,5802	,4727	1,0000	
quality	HQLAH	,7800	,1426	-,0515	,1251	,1280	,4219	,6550	,2581	,0000	1,0000

[a] The codes of the variables are the same as those used in table 8.14 and only factor loadings -0,5 > F > 0,5 are displayed.

high incomes and high occupational levels reside, are characterised by large dwellings that are situated on large sites for which high prices have been paid (r = 0,7126) and that have generally been designed by architects (r = 0,7800). The correlation coefficient between high-quality architecturally designed housing and large homes is r = 0,6550. Scheme houses are not large, nor are they situated on large lots or have high prices been paid for them (r =-0,5802). Scheme houses are generally older and small (r = 0,4727).

The reduction of the dimensionality of the external environmental data of housing through the application of factor analysis was highly successful. The original data were simplified and the same objects were represented by fewer dimensions while most of the variability in the original space was retained. The original thirty-four variables that measured certain aspects of the external environmental attributes of housing, were reduced to ten. The original thirteen variables that measured the socio-economic status of neighbourhood residents were reduced to four constructs that accounted for 83,7 % of the variance in **R**. The original eight variables that measured the pride of ownership exhibited by residents of neighbourhoods were reduced to two constructs that accounted for 75,8 % of the variance in **R**. The original nine variables to describe the quantity of housing in each neighbourhood were reduced to two dimensions that accounted for 84,3 % of the variance in **R**. The original four variables to measure the quality of housing of neighbourhoods were also reduced to two constructs, but these accounted for 91,5 % of the variance in **R**.

8.3 Regression analyses

The initial eighty-three variables that were to serve as predictor variables were, by factor-analysing a section of the variables, reduced to sixty. It was, however, felt that this still constituted an exceedingly large set of predictor variables and that further variable selection and reduction were still required. Further considerations which indicated that the use of a variable-selection procedure in building a model of the market price function of housing was required were firstly the fact that a final model of the market price function of housing had not yet been formulated, especially in respect of South Africa where there is a total scarcity of empirical or theoretical attempts at such model construction, and secondly the exploratory nature of this study. Although the selection of the variables that were to be included in the regression analyses was undertaken in accordance with the conceptual framework of the determinants of housing prices formulated previously[1], there was no preconceived idea of the relative importance of these variables in determining the price of housing. To overcome this shortcoming and to select a smaller number of predictor variables, stepwise regression - a procedure that can successfully be used in variable selection and reduction - was used to build, in a highly exploratory fashion, a model of the implicit prices of housing attributes that best predicted the market price of housing.

8.3.1 Variable description

Table 8.14 contains a summary of the description and codes of the

[1] See p. 176

variables used in the multiple regression analyses. A more comprehensive description of the variables and the sources of the data is set out in appendix A. Summary statistics of the dependent variables and continuous predictor variables, indicated for the study area as a whole and for each social status area separately, are set out in table 8.15. Similar information in respect of the dichotomous and discrete predictor variables is contained in table 8.16. The correlation matrix between the dependent and predictor variables and between each of the predictor variables is contained in appendix B.

It should be noted from table 8.14 that various variables that have been important determinants of the value of housing in other studies, do not figure as predictor variables in any of the regression analyses undertaken in this study. These variables are access to recreational areas, to neighbourhood shops, to churches and to various educational institutions and educational areas. Because of the uniform spatial distribution of these services in Bloemfontein, there was not sufficient variation in accessibility to these services to warrant their inclusion in any of the analyses. This is a similar situation as that found by Richardson *et al.*, (1975) in Edinburgh (p. 74).

8.3.2 Correlation matrix and multicollinearity

An inspection of the correlation matrix revealed that eighteen of the correlations were $\geq |0{,}7000|$ with only one correlation

Table 8.14 SUMMARY OF DESCRIPTION AND CODES OF VARIABLES USED IN MULTIPLE REGRESSION ANALYSES[a]

Description	Code
A. Dependent variable	
Last sales price	PRICE
B. Independent variables	
1. Physical characteristics and structural development of individual dwellings	
1.1 Structural development	
1.1.1 Housing quantity	
Area of main building	MAREA
Area of outbuildings	OAREA
Area of roofed porches	PAREA
Area of unroofed porches	UPAREA
Number of living rooms	NROOM
Number of other rooms	OROOM
Number of bedrooms	BEDR
Number of bathrooms	BATH
Number of rooms in outbuildings	OUTBLD
Number of lock-up garages	GARAG
Number of carports	CPORT
1.1.2 Housing quality	
Age of dwelling	DATE
Condition of dwelling	COND
Housing type	HTYPE
Design of dwelling	DESIGN
Architectural design	DSTYLE
Exterior finish	EXT
Roof covering	ROOF
Kitchen cupboards	KCUP
Fixed white goods in kitchen	KFIX
Sanitation fixtures in kitchen	KSAN
Bedroom wardrobes	BEDC
Air-conditioning	AIRCON
Burglar-proofing	BURGLR
Heating	HEAT
Sanitation points in outbuildings	OUTBS
Borehole	BORE
Swimming pool	POOL
Driveway development	DRIVE
Extent of fencing	FENCE
Extent of garden development	GARDEN
1.2 Site characteristics	
1.2.1 Site quantity	
Gross area of site	GLSZ
Nett area of site	NLSZ
Subdivisibility of site	DIV

Table 8.14 Continued...

Description	Code
1.2.2 Site quality	
View from site	VIEW
Gradient of site	GRAD
Soil type	SOIL
Height above sea level	HEIGHT
Length of frontage	FRONT
Depth of site	DEPTH
2. Environmental characteristics	
2.1 Physical environment	
2.1.1 Environmental quality	
Perception of smoke pollution	PERCPP
Distance to nearest industrial area	DIND
Distance to nearest railway line	DRAIL
Distance to nearest freeway	DFREE
2.1.2 Neighbourhood housing quantity	
Housing and site quantity	HSQT
Age of housing stock	AGED
2.1.3 Neighbourhood housing quality	
Low quality housing	LQLH
High quality architecturally designed housing	HQLAH
2.2 Social environment	
2.2.1 Neighbourhood socio-economic status	
Income and occupational status	INOC
Occupational and educational levels	OCED
Middle-high occupational status	MHOC
Occupational participation of mothers	OPM
Perception of safety	PERCPS
2.2.2 Neighbourhood pride of ownership	
New housing development	NHD
Pride of ownership	PROW
2.3 Fiscal environment	
Municipal tax	TMT84
3. Locational and accessibility factors	
Distance to CBD	DCBD
Distance to head of household's work place	TWORK
Distance to nearest community shopping centre	DREGC
4. Institutional behaviour and constraints	
4.1 Financial constraints	
Availability of funds	REDL

[a] A detailed description of the variables used and their sources is presented in Appendix A

Table 8.15 SUMMARY STATISTICS OF DEPENDENT AND CONTINUOUS INDEPENDENT VARIABLES USED IN MULTIPLE REGRESSION ANALYSES[a)]

	Unstratified model		Stratified model						
Variable	Mean	Standard deviation	Social status area 1 Mean	Social status area 2 Mean	Social status area 3 Mean	Social status area 4 Mean	Social status area 5 Mean	Social status area 6 Mean	Social status area 7 Mean
Last sales price	71 351,635	25 148,835	48 128,663	58 936,179	70 080,780	71 290,853	104 618,920	83 482,963	124 903,846
Area of main building	152,426	43,096	118,149	129,804	156,358	153,863	194,170	177,481	230,308
Area of outbuildings	42,380	21,056	38,485	37,845	44,925	37,498	56,773	48,889	59,038
Area of roofed porches	5,691	12,611	8,040	4,583	5,585	1,463	8,398	14,481	23,654
Area of unroofed porches	5,887	12,622	5,059	6,815	5,566	3,468	10,170	4,407	13,615
Number of living rooms	5,840	1,218	4,871	5,357	5,786	5,948	6,977	6,556	7,500
Number of other rooms	7,056	1,973	5,683	6,048	6,887	7,286	9,034	8,259	9,962
Number of bedrooms	3,230	0,552	2,960	3,137	3,126	3,242	3,591	3,556	3,846
Number of bathrooms	180,304	57,749	117,663	153,738	178,063	200,615	229,466	188,296	253,846
Number of rooms in outbuildings	0,847	0,936	1,208	0,690	1,088	0,260	1,250	1,296	2,385
Number of lock-up garages	141,875	71,522	100,990	126,786	129,560	158,009	189,773	155,556	153,846
Number of carports	31,250	66,738	47,525	26,786	51,572	11,688	22,727	44,444	61,538
Age of dwelling	146,475	169,449	341,515	145,488	171,302	35,567	75,977	287,444	320,962
Exterior finish	131,442	7,716	129,495	127,482	130,667	134,727	134,182	130,556	131,808
Roof covering	115,684	29,469	103,564	113,167	118,019	113,978	126,114	115,556	144,731
Fixed white goods in kitchens	15,344	44,028	4,842	6,321	14,365	15,506	35,761	33,815	30,692
Sanitation fixtures in kitchen	147,125	61,666	109,406	121,726	132,075	187,446	164,205	131,481	150,000
Bedroom wardrobes	82,590	29,491	51,020	74,917	85,516	94,351	94,477	84,296	90,423
Sanitation points in outbuildings	39,645	19,526	37,931	37,250	38,107	35,801	49,295	45,519	66,577
Extent of fencing	461,010	310,623	546,535	577,685	421,931	269,706	652,443	561,037	561,731
Gross area of site	1 237,110	379,556	960,396	1 040,512	1 264,560	1 209,632	1 660,602	1 502,074	1 950,115
Nett area of site	1 213,567	375,374	958,406	1 019,923	1 264,560	1 153,455	1 640,182	1 502,074	1 934,731
Gradient of site	2,691	2,051	1,906	2,521	1,967	2,892	3,603	3,927	5,115
Height above sea level	425,370	19,501	403,327	426,113	416,157	438,242	433,830	423,333	421,654
Length of frontage	34,454	18,212	26,604	29,488	37,591	35,801	42,045	31,926	42,808

Table 8.15 Continued

Variable	Unstratified model Mean	Unstratified model Standard deviation	Stratified model Social status area 1 Mean	Social status area 2 Mean	Social status area 3 Mean	Social status area 4 Mean	Social status area 5 Mean	Social status area 6 Mean	Social status area 7 Mean
Depth of site	42,980	8,813	39,079	41,030	42,692	41,831	49,841	51,630	50,500
Perception of smoke pollution	0,792	0,109	0,658	0,808	0,822	0,839	0,866	0,764	0,816
Shortest distance to nearest industrial area	3 892,246	1 566,382	2 853,168	3 249,464	4 501,635	4 014,468	4 924,773	4 250,741	3 402,500
Shortest distance to nearest railway line	1 823,152	1 288,746	358,713	1 394,589	2 163,893	1 835,268	3 112,386	3 318,519	2 173,269
Shortest distance to nearest freeway	1 747,022	1 505,868	3 333,000	1 571,554	1 714,447	739,909	1 947,250	2 867,407	4 025,769
Housing and site quantity*	0,102	-	-1,085	-1,299	0,543	0,078	1,508	0,760	2,550
Age of housing stock*	-0,360	-	1,188	-0,035	-0,402	-1,092	-0,360	1,462	1,664
Low quality housing*	-0,570	-	1,928	1,211	-0,609	-0,629	-0,277	-0,417	-0,025
High quality architecturally designed housing*	-0,342	-	-0,416	-0,150	-0,460	-0,608	2,049	0,986	3,946
Income and occupational status*	-0,351	-	-0,754	-0,564	-0,564	-0,270	1,392	1,126	4,139
Occupational and educational level*	-0,221	-	-0,487	-0,531	0,674	-0,190	-0,402	1,601	0,197
Middle-high occupational status *	0,101	-	-1,056	-0,429	1,279	0,199	0,306	-0,562	-0,552
Occupational participation of mothers*	-0,292	-	-0,271	-0,570	0,596	-0,413	2,121	1,743	-0,153
Perception of safety	0,678	0,077	0,660	0,692	0,652	0,680	0,688	0,755	0,733
New housing development*	0,380	-	1,002	0,380	0,744	-1,188	-0,454	0,715	0,741
Pride of ownership*	-0,219	-	-0,989	0,742	-0,815	-0,219	1,760	0,310	0,114
Municipal tax	465,094	152,675	283,445	372,344	479,265	482,566	681,837	491,739	766,882
Distance to CBD	4 754,456	1 357,024	3 666,089	4 933,512	4 632,893	5 573,680	4 748,977	3 802,963	3 220,000
Distance to head of household's work place	11,515	8,565	10,703	12,631	11,145	11,935	11,511	7,667	10,000
Distance to nearest community shopping centre	2 289,306	1 143,449	2 516,634	2 109,048	2 135,189	1 891,212	3 428,750	2 470,741	3 005,385

a) For all variables indicated by * the median instead of the mean is indicated

Table 8.16 SUMMARY STATISTICS OF DICHOTOMOUS AND DISCRETE INDEPENDENT VARIABLES USED IN MULTIPLE REGRESSION ANALYSES

Statistics	Unstratified model		Stratified model													
			Social status area 1		Social status area 2		Social status area 3		Social status area 4		Social status area 5		Social status area 6		Social status area 7	
	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Condition of dwelling																
Dilapidated condition	8	1,0	2	2,0	2	1,2	2	1,3	1	0,4	-	-	-	-	1	3,8
Repairs required	167	20,9	47	46,5	45	26,8	32	20,1	18	7,8	12	13,6	6	22,2	7	26,9
Average condition	132	16,5	24	23,8	36	22,0	31	19,5	16	6,9	17	19,3	4	14,8	3	11,5
Good condition	207	25,9	18	17,8	63	37,5	32	20,1	39	16,9	34	38,6	10	37,0	11	42,3
New condition	286	35,7	10	9,9	21	12,5	62	39,0	157	68,0	25	28,4	7	25,9	4	15,4
Housing type																
Single housing	783	97,9	84	83.2	168	100,0	159	100,0	231	100,0	88	100,0	27	100,0	26	100,0
Double housing	17	2,1	17	16,8	-	-	-	-	-	-	-	-	-	-	-	-
Design of dwelling																
Single floor	771	96,4	101	100,0	165	98,2	154	96,9	225	97,4	77	87,5	24	88,9	25	96,2
Single and double floor	22	2,7	-	-	1	0,6	3	1,9	4	1,7	11	12,5	2	7,4	1	3,8
Double storey	6	0,7	-	-	2	1,2	1	0,6	2	,9	-	-	1	3,7	-	-
Three and more storeys	1	0,1	-	-	-	-	1	0,6	-	-	-	-	-	-	-	-
Architectural design																
Dilapidated	5	0,6	5	5,0	-	-	-	-	-	-	-	-	-	-	-	-
Scheme housing	34	4,2	20	19,8	14	8,3	-	-	-	-	-	-	-	-	-	-
Altered scheme housing	75	9,4	28	27,7	47	28,0	-	-	-	-	-	-	-	-	-	-
Standard	605	75,6	47	46,5	102	60,7	151	95,0	226	97,8	54	61,4	21	77,8	4	15,4
Architecturally	81	10,1	1	1,0	5	3,0	8	5,0	5	2,2	34	38,6	6	22,2	22	84,6

Table 8.16 Continued...

	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Kitchen cupboards																
None	68	8,5	22	21,8	23	13,7	4	2,5	14	6,1	1	1,1	1	3,7	3	11,5
Too few	172	21,5	28	27,7	49	29,2	35	22,0	30	13,0	20	22,7	5	18,5	5	19,2
Enough	560	70,0	51	50,5	96	57,1	120	75,5	187	81,0	67	76,1	21	77,8	18	69,2
Air-conditioning (yes)	39	4,9	3	3,0	5	3,0	6	3,8	5	2,2	13	14,8	3	11,1	4	15,4
Burglar-proofing (yes)	474	59,2	77	76,2	123	73,2	88	55,3	86	37,2	62	70,5	17	63,0	21	80,8
Heating (yes)	281	35,1	43	42,6	50	29,8	74	46,5	37	16,0	43	48,9	13	48,1	21	80,8
Borehole (yes)	56	7,0	5	5,0	3	1,8	25	15,7	4	1,7	8	9,1	2	7,4	9	34,6
Swimming pool (yes)	119	14,9	2	2,0	19	11,3	22	13,8	11	4,8	35	39,8	11	40,7	19	73,1
Driveway development (yes)	454	56,7	37	36,6	111	66,1	97	61,0	83	35,9	84	95,5	18	66,7	24	92,3
Garden development																
No garden development	269	33,6	20	19,8	27	16,1	54	34,0	148	64,1	9	10,2	9	33,3	2	7,7
Weak garden development	217	27,1	49	48,5	67	39,9	30	18,9	36	15,6	20	22,7	7	25,9	8	30,8
Good (new) garden development	64	8,0	3	3,0	21	12,5	5	3,1	18	7,8	15	17,0	-	-	2	7,7
Good (establish) garden development	250	31,3	29	28,7	53	31,5	70	44,0	29	12,6	44	50,0	11	40,7	14	53,8
Subdivisibility																
Not subdivisible	766	95,7	100	99,0	164	97,6	157	98,7	230	99,6	77	87,5	24	88,9	14	53,8
One additional subdivision possible	30	3,7	1	1,0	4	2,4	2	1,3	-	-	11	12,5	3	11,1	9	34,6
Two additional subdivisions possible	4	0,5	-	-	-	-	-	-	1	0,4	-	-	-	-	3	11,5
View from site																
No view	779	97,4	101	100,0	166	98,8	159	100,0	220	95,2	82	93,2	27	100,0	24	92,3
Excellent view	21	2,6	-	-	2	1,2	-	-	11	4,8	6	6,8	-	-	2	7,7

Table 8.16 Continued...

	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Soil type																
Clay or rock[a]	363	45,4	77	76,2	68	40,5	105	66,0	75	32,5	32	36,4	2	7,4	4	15,4
Normal soil	412	51,5	24	23,8	96	57,1	54	34,0	155	67,1	50	56,8	24	88,9	9	34,6
Good soil	25	3,1	-	-	4	2,4	-	-	1	0,4	6	6,8	1	3,7	13	50,0
Availability of funds																
No loans	64	8,0	52	51,5	2	1,2	4	2,5	5	2,2	-	-	1	3,7	-	-
Loans ≤ 74 % of price	106	13,2	39	38,6	37	22,0	21	13,2	1	0,4	10	11,4	6	22,2	2	7,7
Loans 75 % of proce	158	19,7	10	9,9	81	48,2	26	16,4	22	9,5	78	88,6	8	29,6	1	3,8
Loans 80 % of price	472	59,0	-	-	48	28,6	108	67,9	203	81,9	-	-	12	44,4	23	88,5

[a] Clay and rock are viewed as less desirable soil types. Clay soils can lead to cracks developing in houses while clay and rock entail extreme gardening difficulties.

≥ |0,9000| (1,02 % and 0,06 % of the correlations respectively). The highest bivariate correlation was recorded between gross lot size and nett lot size. This was expected. An r_{ij} = 0,943 indicates that the two variables are essentially similar and that one of the variables should be deleted as redundant. Both variables were, however, retained specifically to measure the influence of legal inpediments (in this case servitudes) that prevented the full utilisation and exploitation of housing, on the price of housing. All the bivariate correlations revealed the expected signs and values. No correlations revealed any untoward or unexpected high or low absolute values. All values of r_{ij} ≥|0,7000| are highlighted in appendix B.

According to Afifi and Clark bivariate correlations ≥ |0,9500| and squared multiple correlations ≥ 0,9900 or tolerance values ≤ 0,0100 are indicative of problems with bivariate collinearity, multicollinearity and singularity of the correlation matrix (p. 147). An initial standard multiple regression analysis with all predictor variables partaking, revealed squared multiple correlations ranging from 0,12495 to 0,93681. The squared multiple correlations recorded in respect of all predictor variables are recorded in table 8.17. With the highest bivariate correlation <|0,9500| and the highest squared multiple correlation < 0,9900, bivariate collinearity, multicollinearity and singularity of the correlation matrix would thus not be a problem in the regression analyses.

Eight regression equations, one each for the seven social status areas and one for the White single dwelling housing submarket as a whole, were calculated. The criterion or stopping rule used in

Table 8.17 SQUARED MULTIPLE CORRELATIONS AND TOLERANCE VALUES OF ALL PREDICTOR VARIABLES

Variable	Code	Squared multiple correlation	Tolerance
Area of main building	MAREA	,77263	,22737
Area of outbuildings	OAREA	,48612	,51388
Area of roofed porches	PAREA	,39340	,60660
Area of unroofed porches	UPAREA	,20602	,79398
Number of living rooms	NROOM	,85656	,14344
Number of other rooms	OROOM	,85353	,14647
Number of bedrooms	BEDR	,54060	,45940
Number of bathrooms	BATH	,68475	,31525
Number of rooms in outbuildings	OUTBLD	,64928	,35072
Number of lock-up garages	GARAG	,56674	,43326
Number of car-ports	CPORT	,36489	,63511
Age of dwelling	DATE	,86522	,13478
Condition of dwelling	COND	,55236	,44764
Housing type	HTYPE	,43732	,56268
Design of dwelling	DESIGN	,21175	,78825
Architectural design	DSTYLE	,63118	,36882
Exterior finish	EXT	,30126	,69874
Roof covering	ROOF	,22067	,77933
Kitchen cupboards	KCUP	,30718	,69282
Fixed white goods in kitchen	KFIX	,17233	,82767
Sanitation fixtures in kitchen	KSAN	,38975	,61025
Bedroom wardrobes	BEDC	,49224	,50776
Airconditioning	AIRCON	,14380	,85620
Burglar-proofing	BURGLR	,35166	,64834
Heating	HEAT	,38061	,61939
Sanitation points in outbuildings	OUTBS	,33871	,66129
Borehole	BORE	,27687	,72313
Swimming pool	POOL	,66467	,33533
Driveway development	DRIVE	,42389	,57611
Extent of fencing	FENCE	,60190	,39810
Extent of garden development	GARDEN	,54400	,45600
Gross area of site	GLSZ	,93428	,06572
Nett area of site	NLSZ	,91843	,08157
Subdivisibility of site	DIV	,53675	,46325
View from site	VIEW	,37328	,62672
Gradient of site	GRAD	,50465	,49535
Soil type	SOIL	,43221	,56779
Height above sea level	HEIGHT	,84676	,15324
Length of frontage	FRONT	,48512	,51488
Depth of site	DEPTH	,66107	,33893
Perception of smoke pollution	PERCPP	,60262	,39738
Distance to nearest industrial area	DIND	,81035	,18965
Distance to nearest railway line	DRAIL	,75513	,24487
Distance to nearest freeway	DFREE	,90226	,09774
Housing and site quantity	HSQT	,91727	,08273
Age of housing stock	AGED	,90089	,09911
Low quality housing	LQLH	,87740	,12260
High quality architecturally designed housing	HQLAH	,91186	,08814
Income and occupational status	INOC	,87608	,12392
Occupational and educational levels	OCED	,60521	,39479

Table 8.17 Continued

Variable	Code	Squared multiple correlation	Tolerance
Middle-high occupational status	MHOC	,70084	,29946
Occupational participation of mothers	OPM	,62725	,37275
Perception of safety	PERCPS	,41479	,58521
New housing development	NHD	,89895	,10105
Pride of ownership	PROW	,70639	,29361
Municipal tax	TMT84	,93681	,06319
Distance to CBD	DCBD	,89316	,10684
Distance to head of household's work place	TWORK	,12495	,87505
Distance to nearest community shopping centre	DREGC	,77318	,22682
Availability of funds	REDL	,62539	,37461

all the stepwise regression analyses was a minimum F-to-enter of 2,07 (equivalent to a P value of 0,15) and a maximum F-to-remove of 1,07 (equivalent to a P value of 0,30) as recommended by Afifi and Clark (p. 179).

With eight hundred cases and sixty predictor variables, the cases to variable ratio is 13,3:1 which is well above the minimum requirement for regression set by Tabachnick and Fidell (p. 92).

8.3.3 Violation of assumptions

To check for the violation of the assumptions that the errors of prediction are independent and normally distributed at all levels of the predicted variable **(normality)**; that the variance of the errors of prediction is approximately equal at all values of the predicted variable (equality of variance or **homoscedasticity**); and that **linearity** in the relationship between predicted dependent variable scores and errors of prediction scores exists; scatterplots of the studentised residuals versus the predicted values and normal probability plots of the studentised residuals were inspected for each regression analysis. These plots for the various regression analyses are displayed in diagrams 8.5 to 8.12. Studentised residuals were used in the analyses in preference to raw or standardised residuals. This was done because the studentised residuals reflect more precisely differences in the error variances from point to point (Norusis, p. 24), because they minimise the effects of an extreme outlier (Afifi et al., p. 100) and because raw residuals as well as standardised residuals can fail to properly identify outliers owing to variations in their standard errors (Gunst et al., p. 252).

The normal probability plots in respect of the unstratified model and social status group 7 reveal deviations from the expected straight line. The shape of the normal probability plots takes the form of a leptokurtic distribution (Bock, p. 159). This is usually evidence of the presence of multivariate outliers in the cases (Bock, p. 161). The normal probability plots for the other social status areas are quite straight. The assumption of normality is not violated in the stratified regression analyses for social status areas 1 to 6.

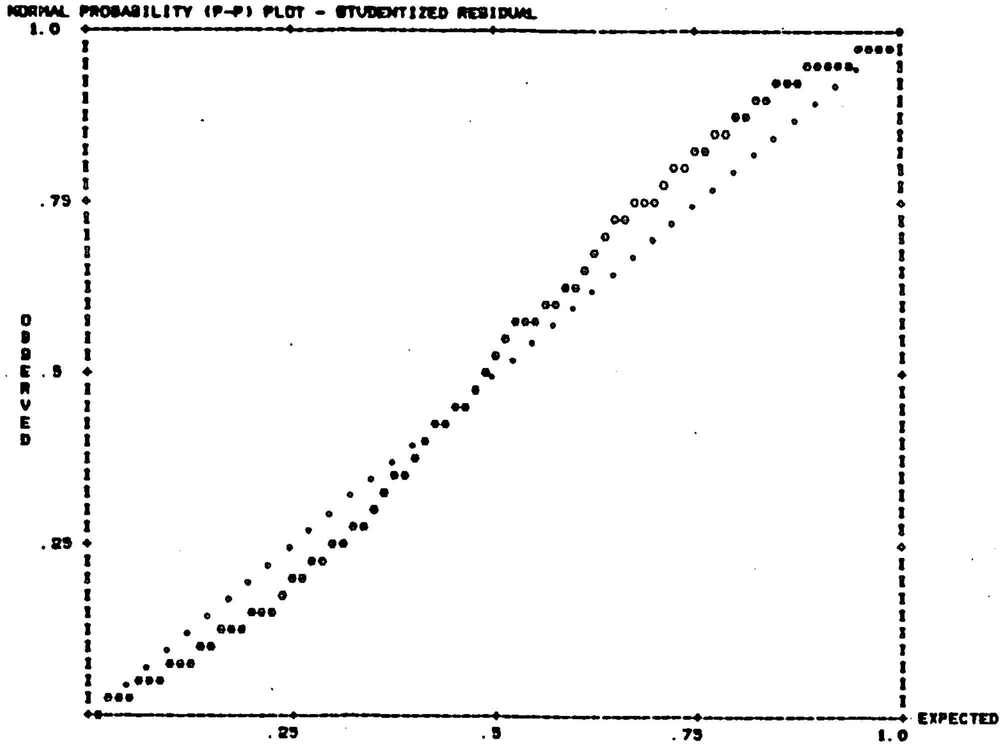
The overall shape of the scatterplots of the studentised residuals versus the predicted values indicates that the equality-of-variance assumption and assumption of linearity are met in the case of the seven social status areas. The fan-shaped pattern of the scatterplot of the unstratified model suggests the presence of heteroscedasticity and consequentially that the variability of the predicted price of housing increases with price level. The shape of the pattern does not, however, suggest that the assumption of linearity is violated. The presence of heteroscedasticity in the unstratified model suggests that the unstratified linear model is not very successful, especially at the higher house price levels, in predicting the price of housing. The stratified model does, however, appear to be appropriate.

The preceding observation was verified by the absence of outliers in the stratified model, while the unstratified model had twelve cases with studentised residuals or studentised deleted residuals $\geq |3,000|$, accepted indicators of outlying cases (Gunst et al., p. 258). In table 8.18 the raw, studentised and studentised deleted residuals of the various regression analyses are compared.

As control the stepwise regression analysis in respect of the unstratified model was rerun with all outlying cases deleted. The normal probability plot in respect of the rerun unstratified stepwise regression shows a marked improvement in shape with very small departures from the straight line in evidence, as can be seen from diagram 8.13. The scatterplot of the studentised residuals versus the predicted values also shows a marked improvement with the fan-shaped pattern no longer in evidence. The deletion of the outlying cases has thus markedly improved the prediction ability of the unstratified regression model for the retained cases.

Table 8.18 COMPARISON OF RESIDUALS: UNSTRATIFIED AND STRATIFIED MODELS

Model	Residuals (r_i)		Studentised residuals (t_i)		Studentised deleted residuals (t_{-i})		Number of outlier
	Min	Max	Min	Max	Min	Max	
Unstratified model	-79 540,2109	86 551,4150	-7,8037	8,5349	-8,1262	8,9633	12
Stratified model: social status area 1	-11 117,9741	15 619,4132	-2,0363	2,7990	-2,0724	2,9104	-
Stratified model: social status area 2	-13 539,4681	13 904,2179	-2,6512	2,9334	-2,7093	2,9977	-
Stratified model: social status area 3	-13 591,8787	12 642,8518	-2,5351	2,2317	-2,3997	2,3908	-
Stratified model: social status area 4	-14 520,6195	15 424,6906	-2,4124	2,5936	-2,4408	2,6300	-
Stratified model: social status area 5	-27 187,2002	33 406,5283	-2,0029	2,5448	-2,0449	2,6446	-
Stratified model: social status area 6	-12 365,1460	14 220,0929	-1,8635	2,5547	-2,0267	2,7784	-
Stratified model social status area 7	-76 319,4854	79 857,8184	-2,4631	2,6852	-2,8075	2,9746	-



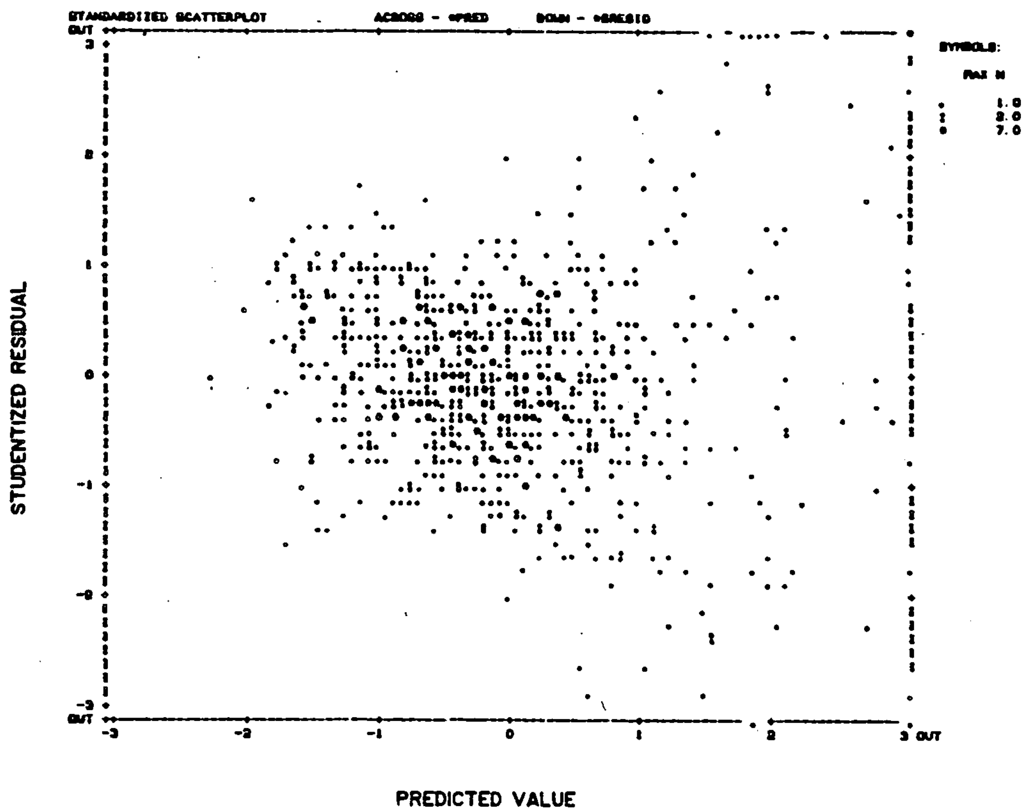
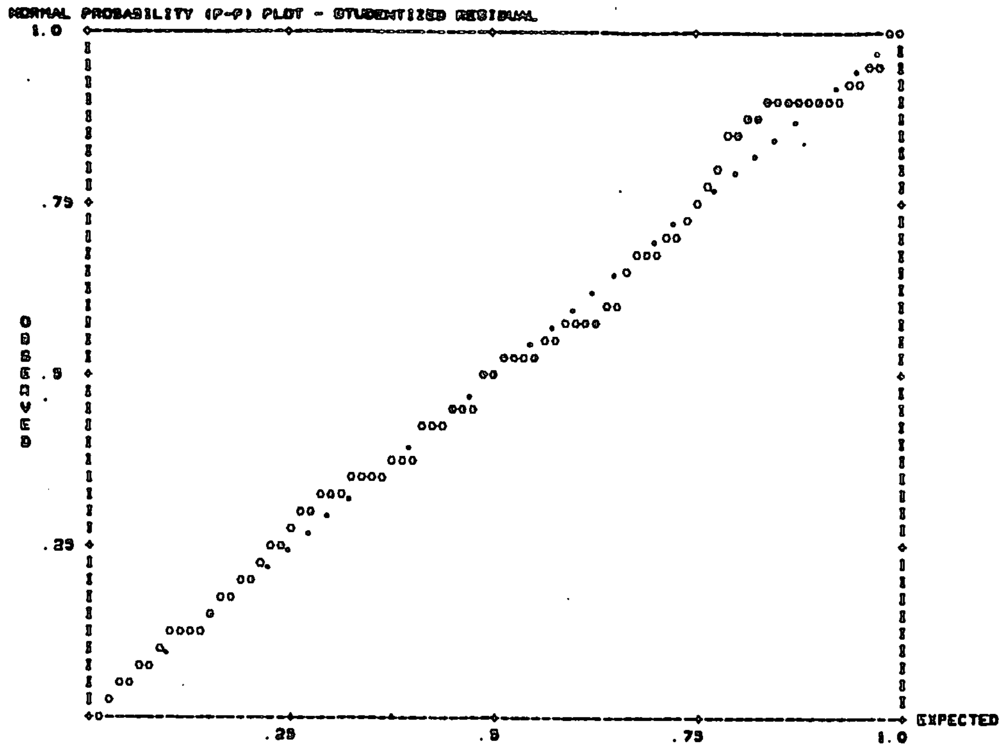


DIAGRAM 8.5 NORMAL PROBABILITY PLOT OF STUDENTIZED RESIDUALS AND STANDARDISED SCATTERPLOT OF PREDICTED VALUES AND STUDENTIZED RESIDUALS - UNSTRATIFIED MODEL



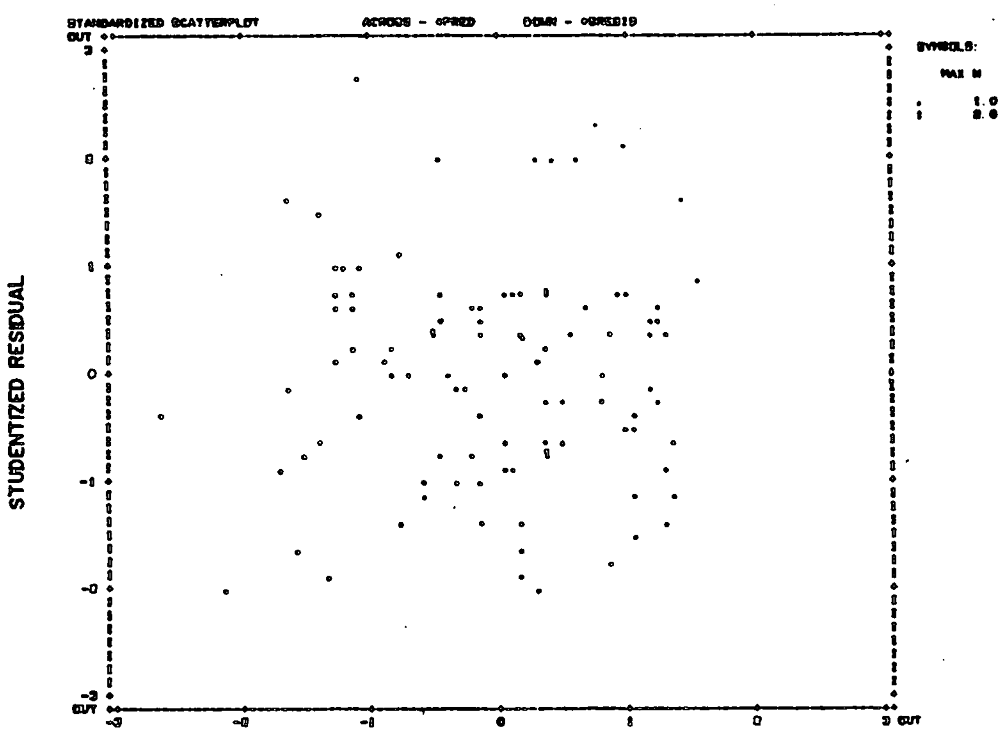
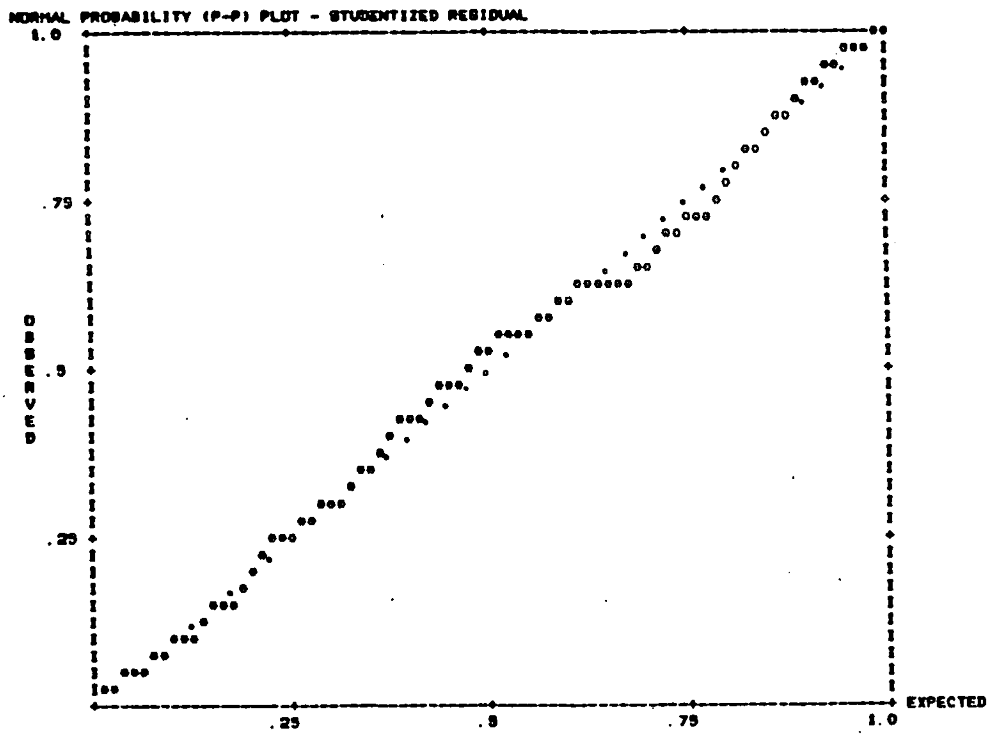


DIAGRAM 8.6 NORMAL PROBABILITY PLOT OF STUDENTIZED RESIDUALS AND STANDARDISED SCATTERPLOT OF PREDICTED VALUES AND STUDENTIZED RESIDUALS - SUBMARKET I



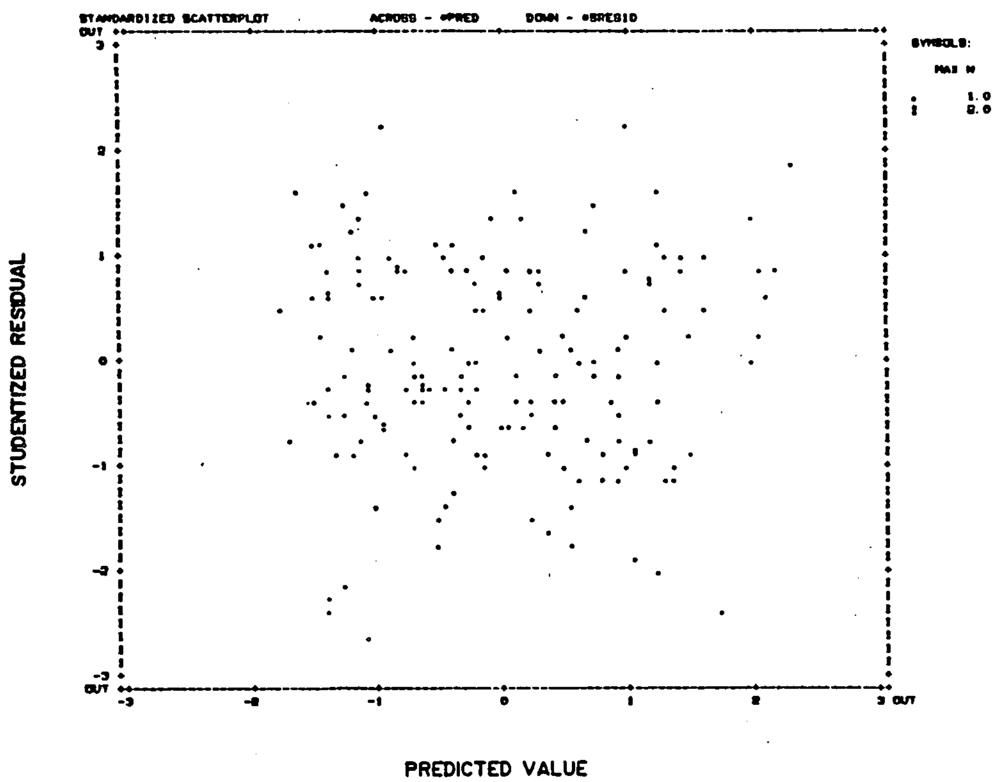
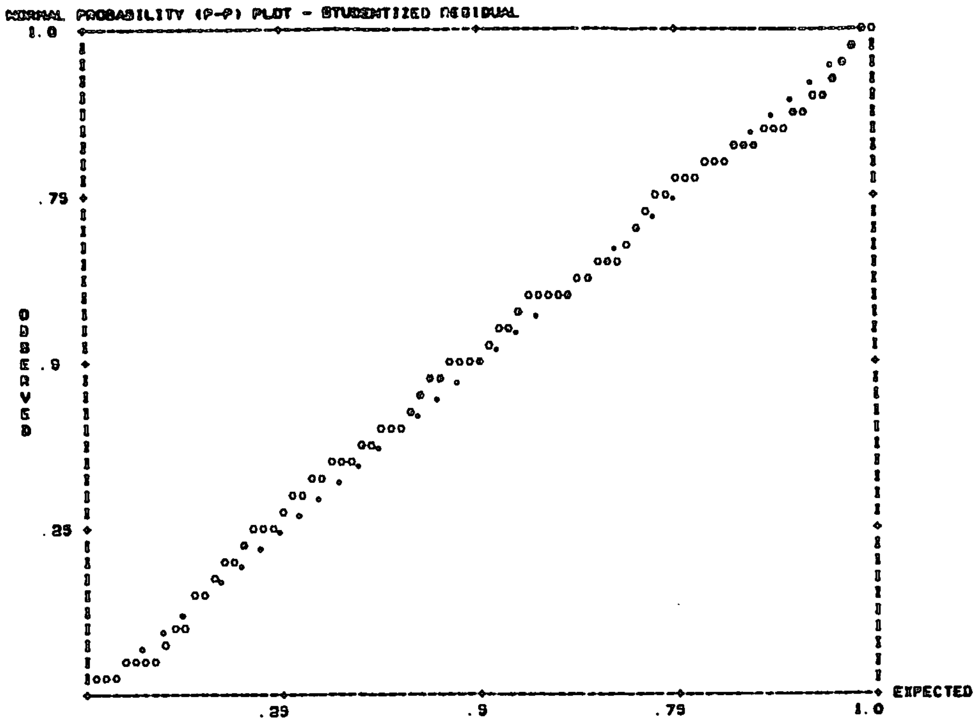


DIAGRAM 8.7 NORMAL PROBABILITY PLOT OF STUDENTIZED RESIDUALS AND STANDARDISED SCATTERPLOT OF PREDICTED VALUES AND STUDENTIZED RESIDUALS - SUBMARKET 2



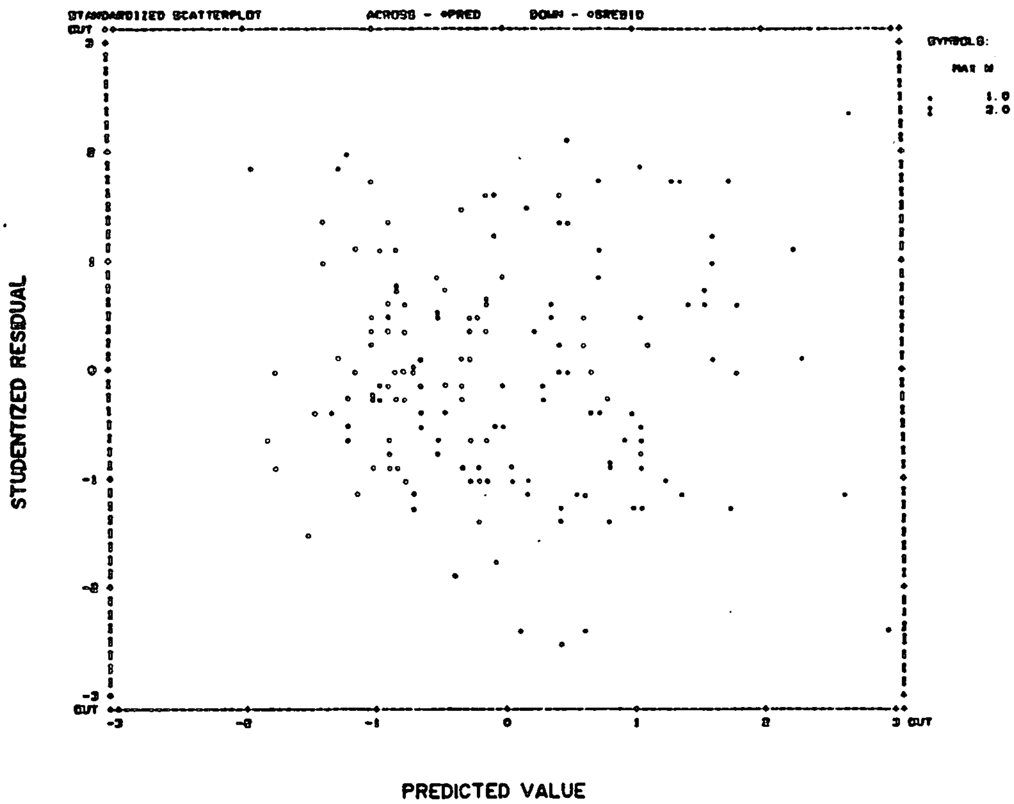
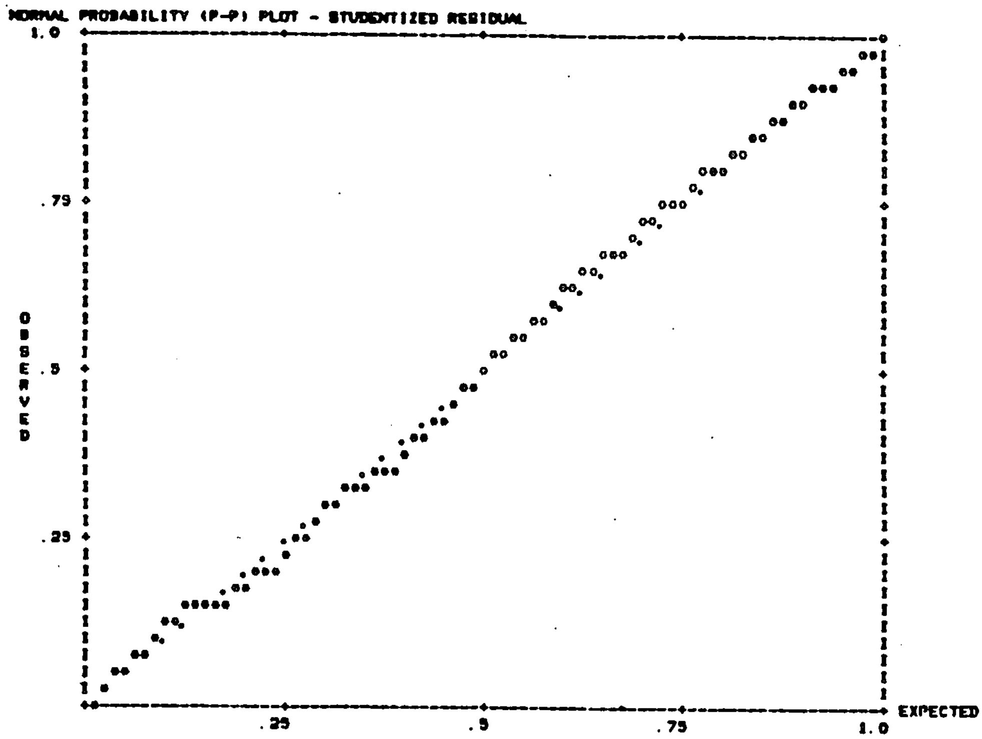


DIAGRAM 8.8 NORMAL PROBABILITY PLOT OF STUDENTIZED RESIDUALS AND STANDARDISED SCATTERPLOT OF PREDICTED VALUES AND STUDENTIZED RESIDUALS - SUBMARKET 3



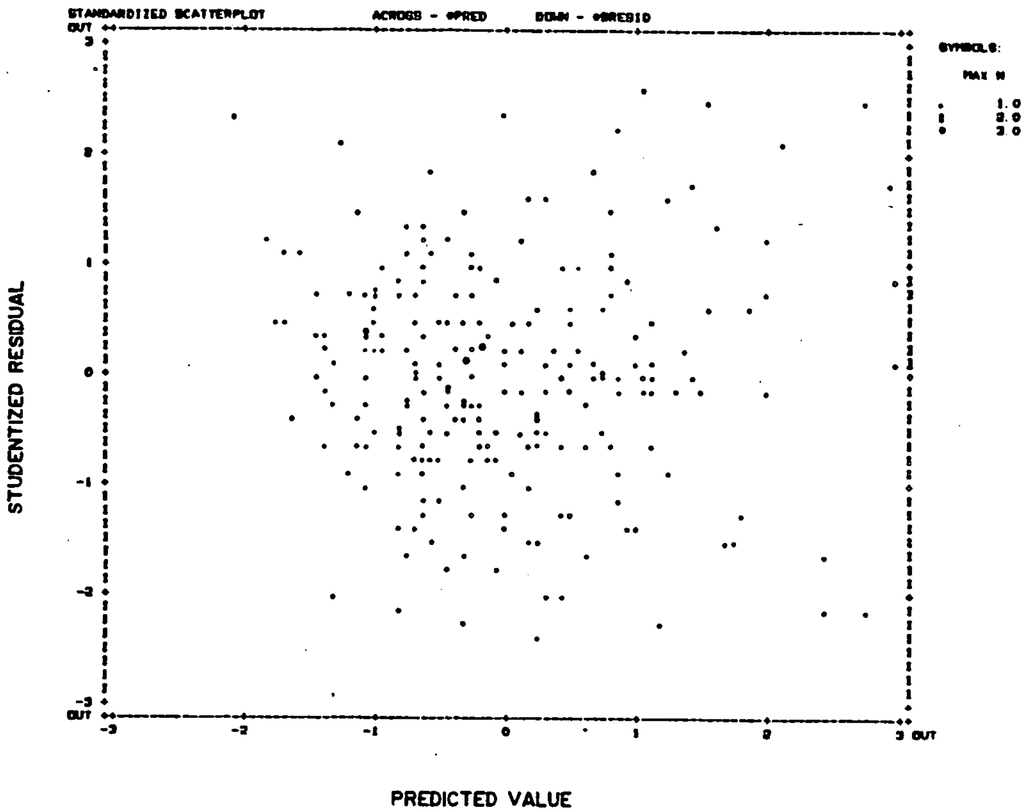
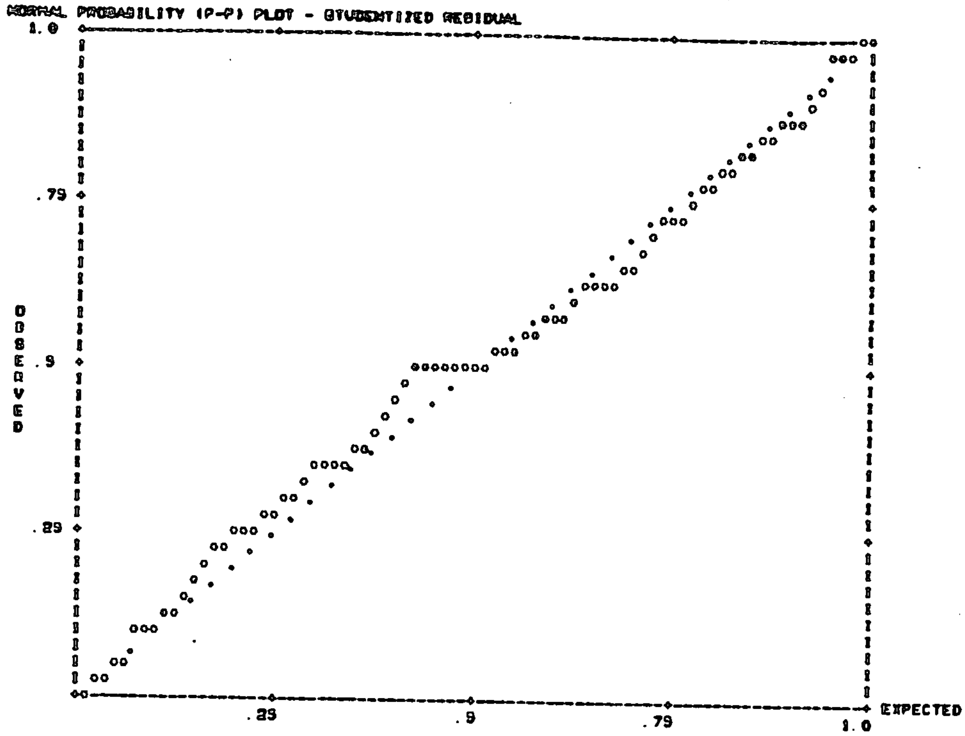


DIAGRAM 8.9 NORMAL PROBABILITY PLOT OF STUDENTIZED RESIDUALS AND STANDARDISED SCATTERPLOT OF PREDICTED VALUES AND STUDENTIZED RESIDUALS - SUBMARKET 4



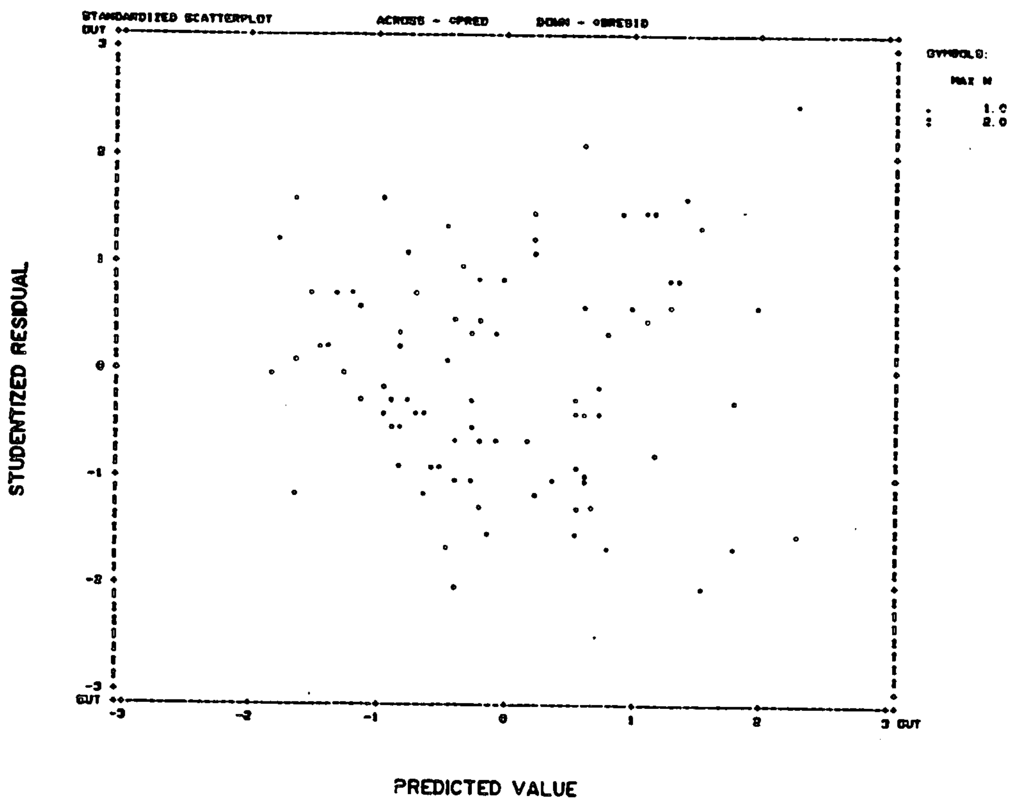
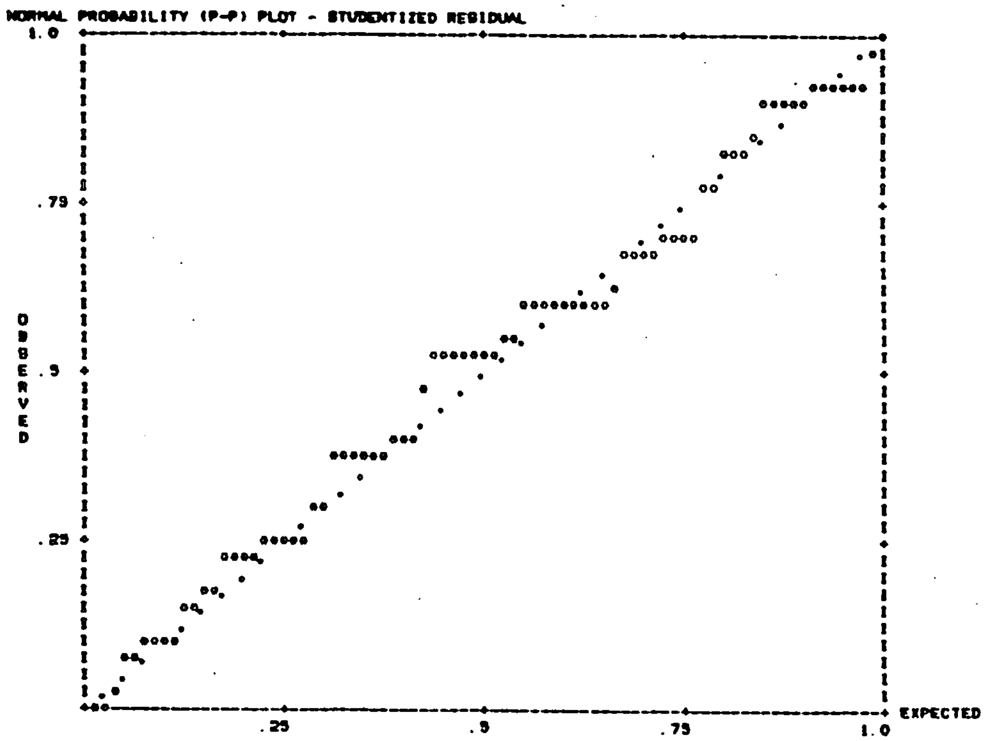


DIAGRAM 8.10 NORMAL PROBABILITY PLOT OF STUDENTIZED RESIDUALS AND STANDARDISED SCATTERPLOT OF PREDICTED VALUES AND STUDENTIZED RESIDUALS - SUBMARKET 5



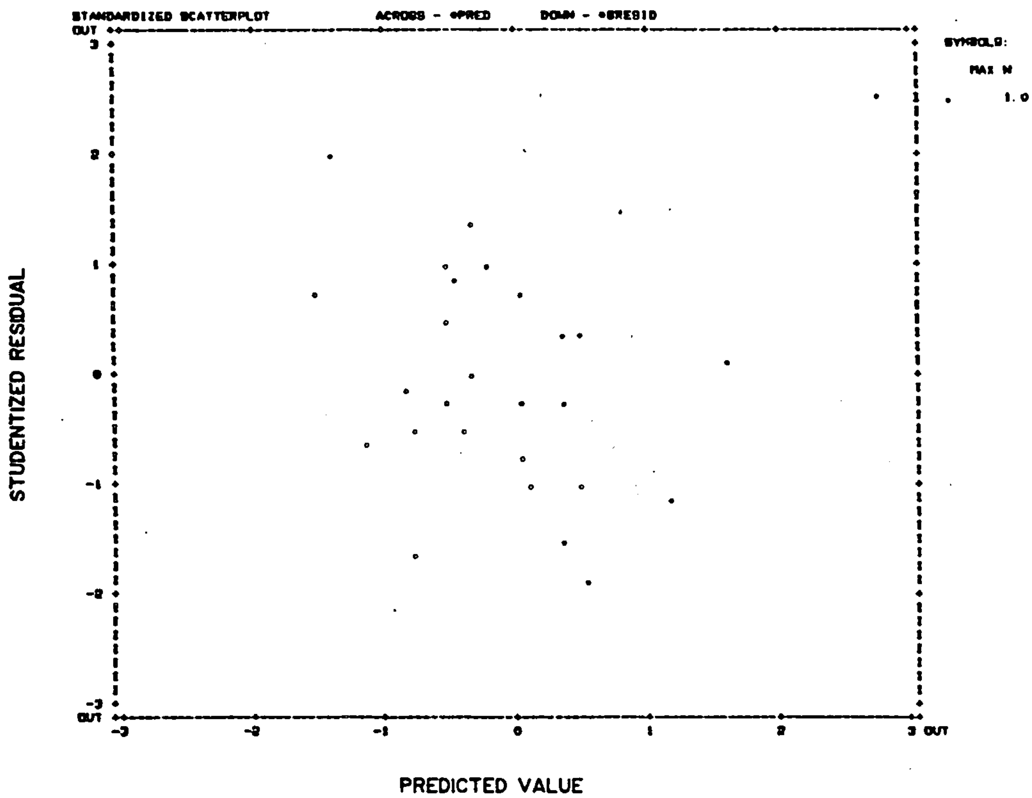
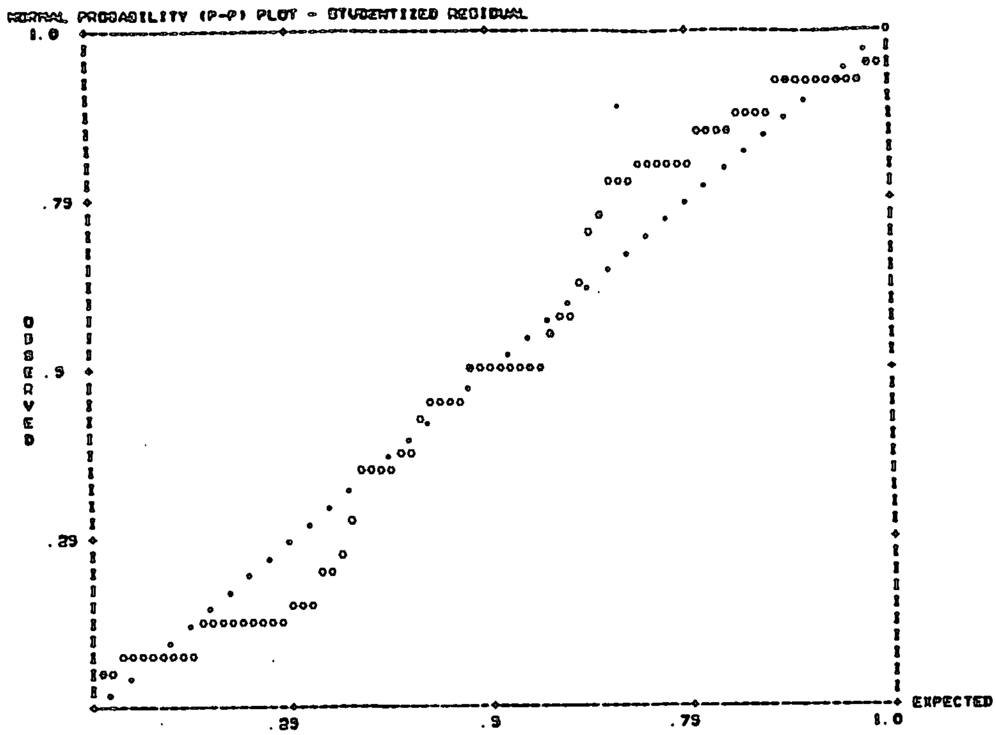


DIAGRAM 8.II NORMAL PROBABILITY PLOT OF STUDENTIZED RESIDUALS AND STANDARDISED SCATTERPLOT OF PREDICTED VALUES AND STUDENTIZED RESIDUALS - SUBMARKET 6



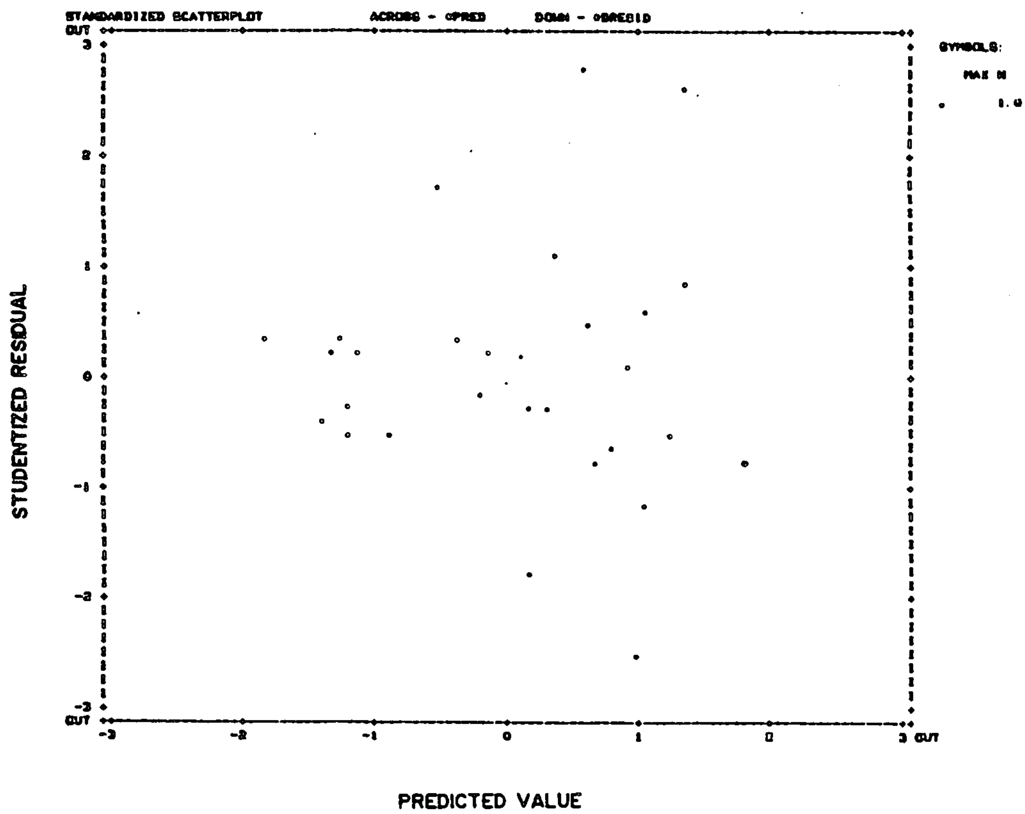
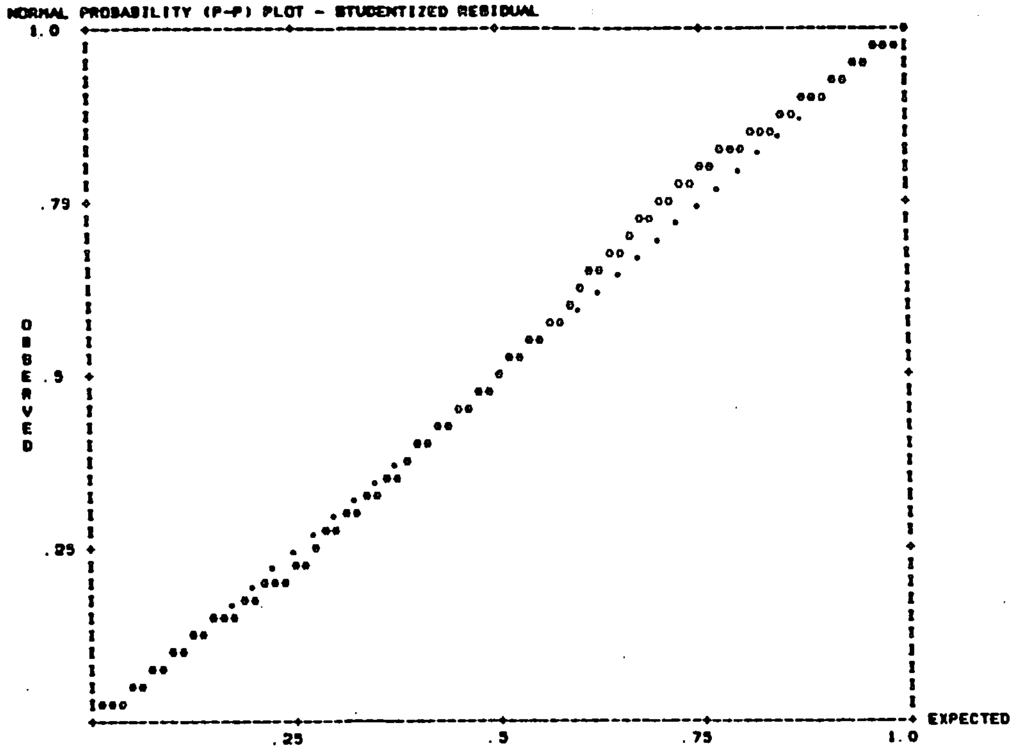


DIAGRAM 8.12 NORMAL PROBABILITY PLOT OF STUDENTIZED RESIDUALS AND STANDARDISED SCATTERPLOT OF PREDICTED VALUES AND STUDENTIZED RESIDUALS - SUBMARKET 7



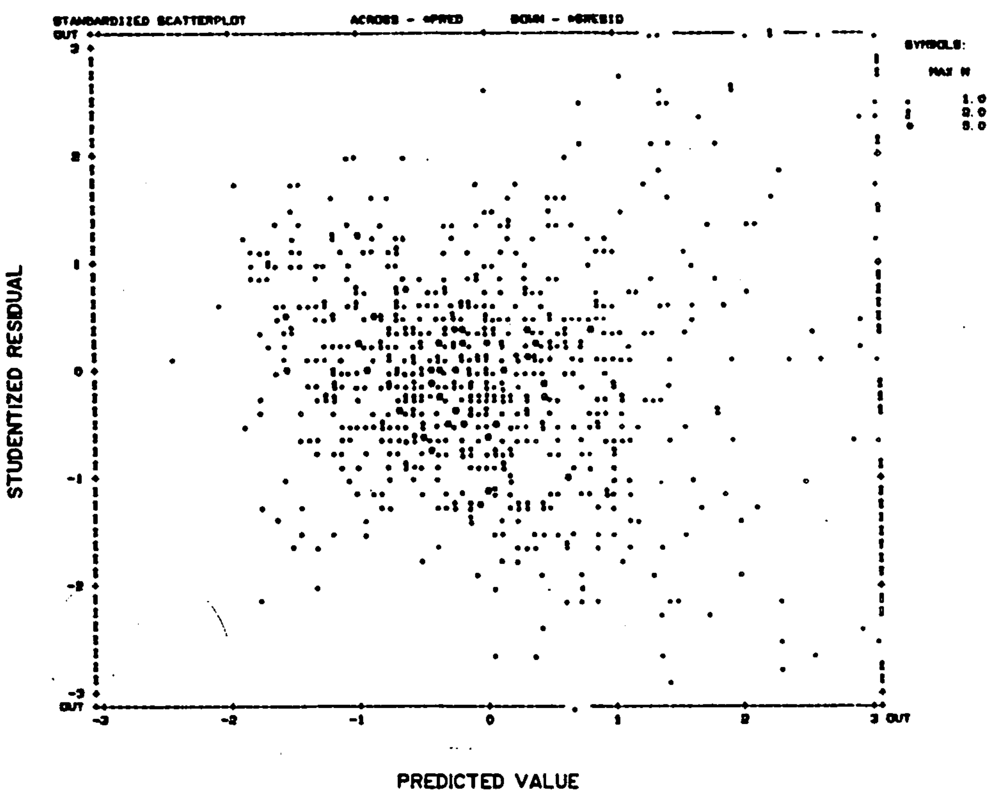


DIAGRAM 8.13 NORMAL PROBABILITY PLOT OF STUDENTIZED RESIDUALS AND STANDARDISED SCATTERPLOT OF PREDICTED VALUES AND STUDENTIZED RESIDUALS - UNSTRATIFIED MODEL WITH OUTLIERS DELETED

Various statistics of the outlying cases in the unstratified model are set out in table 8.19.

It is clear from the table that the unstratified model discriminates against higher priced properties and especially against properties situated in the higher social status areas. 27,08 % of the properties situated in social status area 7 were recorded as outliers while 3,70 % of the properties situated in social status area 6 and 5,68 % of the properties situated in social status area 5 were also recorded as outliers. This could be indicative of a greater variability in the price of housing in the higher social status areas. However, if this were true, a similar number of properties should have been recorded as outliers in the stratified model. None were recorded.

At this stage it would again appear that the stratified model is a better implement to predict the value of housing. Further, if the development of an unstratified model is pursued, a model that

Table 8.19 SUMMARY STATISTICS OF OUTLYING CASES ON THE UNSTRATIFIED REGRESSION MODEL

Number	Social status area	Neighbourhood	Price	Predicted price	Residual	Studentised residual	Studentised deleted residual
24	5	1	187 000	145 268	41 732	4,0876	4,1299
26	5	1	150 000	117 352	32 648	3,1080	3,1256
82	5	5	154 000	117 664	36 336	3,4402	3,4647
214	5	18	145 000	106 800	38 200	3,6877	3,7183
234	5	18	145 500	112 408	33 092	3,1199	3,1378
105	6	3	170 000	115 229	54 771	5,3249	5,4221
60	7	4	250 000	163 449	86 551	8,5349	8,9633
61	7	4	75 000	114 685	-39,685	-3,7583	-3,7908
109	7	4	80 000	159 540	-79,540	-7,8037	-8,1266
114	7	4	170 000	127 073	42 927	4,1173	4,1606
116	7	4	195 300	150 286	45 014	4,3952	4,4482
119	7	4	162 000	113 490	48 510	4,7174	4,7839

would predict the value of lower priced housing better than higher priced housing would be achieved. The development of an unstratified model with the influence of the outliers removed was thus not pursued at this stage.

The estimated hedonic price equation for the unstratified housing price model (outliers not deleted) is set out in appendix C while the estimated hedonic price equation and related statistics for the unstratified housing price model with the outliers removed are set out in appendix D.

8.3.4 Appropriateness of regression models and test for market segmentation

All the regression models have extremely high correlation coefficients (R), high coefficients of determination (R^2) and high adjusted coefficients of determination ($\overline{R}^2$), as can be seen from table 8.20. The R for regression for all models was significantly different from zero, at least at $P < 0,01$. Both the stratified and unstratified models are thus statistically significant in predicting the price of housing. The initial search for the violation of assumptions had, however, suggested that the stratified model might be a better implement than the unstratified model in predicting the value and price of housing.

The general F-test is used to determine statistically whether the unstratified or stratified regression models are more fitting to serve as house price prediction and valuation implement. The F-test at the same time tests whether the White housing market operates as a unified market or as a series of quasi-independent

Table 8.20 COMPARISON OF GOODNESS OF FIT OF THE UNSTRATIFIED AND STRATIFIED REGRESSION MODEL

Statistics	Unstratified model	Stratified model						
		Social status area 1	Social status area 2	Social status area 3	Social status area 4	Social status area 5	Social status area 6	Social status area 7
Multiple correlation coefficient	,90550	,85780	,93781	,90839	,89777	,83916	,96146	,72117
Coefficient of determination (R^2)	,81993	,73582	,87949	,82517	,80599	,70419	,92440	,52008
Adjusted coefficient of determination (R^2)	,81339	,70970	,86121	,79983	,78852	,65686	,88438	,47835
F-ratio of estimate	125,37*	28,163***	48,101*	32,567*	46,134*	14,878***	23,097***	12,462***
Degrees of freedom	(28;71)	(9;91)	(22;145)	(20;138)	(19;211)	(12;75)	(9;17)	(2;23)
Standard error of estimate (SE)	10863,965	6103,622	5752,447	6285,946	6500,512	14808,485	7695,088	32325,211
Residual sum of squares (RSS)	$909,97 \times 10^8$	$33,901 \times 10^8$	$47,981 \times 10^8$	$54,528 \times 10^8$	$89,162 \times 10^8$	$164,47 \times 10^8$	$10,066 \times 10^8$	$240,33 \times 10^8$
No. of cases	800	101	168	159	231	88	27	26
Mean NPRI	71 352	48 129	58 936	69 687	70 983	104 155	83 483	124 904
Sum of the residual sum of squares $640,438 \times 10^8$								

* Significant at $0,05 > P > 0,01$

** Significant at $0,01 > P > 0,001$

*** Significant at $P < 0,001$

submarkets.

The F-statistic = 4,1494 (df: 71,700) which is significant at P > 0,001 (table 8.21) indicates that there is a statistically significant reduction in the residual sum of squares when the geographically stratified model instead of the unstratified model to predict the price of housing is used. The null hypothesis that a single regression plane fitted to the population is the true regression plane and that the geographically unstratified model of housing prices gives a better estimate of the value of housing can be rejected. The statistically significant smaller residual sum of squares for the geographically disaggregated model indicates that the regression coefficients differ beyond chance between the two groups of regression models. The stratified regression model is thus a better implement than the unstratified model to predict the value of housing. The statistically smaller residual sum of squares associated with the stratified model can also be viewed as evidence that the White housing market does not operate as a unitary market but as a segmented market.

Table 8.21 TEST FOR THE SEGMENTATION OF THE MARKET FOR SINGLE-FAMILY DWELLINGS IN BLOEMFONTEIN

Statistics	
Standard error of unstratified regression model (SE^u)	10 863,97
Standard error of statified regression model (SE^s) [a]	9 565,11
SE/SE^u [b]	11,9557
F-statistic	4,1494
Degrees of freedom	(71;700)

[a] The standard error of the stratified regression model (SE^s) is a weighted average of the standard errors of the equations estimated from each standard errors of the equations estimated from each of the 5 subsamples ($SE_1,\ldots,SE_7$) as calcualted by Schnare and Struyk (fn,p.155).

[b] $SE = SE^u - SE^s$

The rejection of the null hypothesis can, however, only be viewed as evidence but not as confirmation of the existence of submarkets. For submarkets to exist, it is not only necessary that there should be significant differences in the sets of coefficients, but also that the differential in the prices of the individual housing attributes relative to the overall variation in housing prices should be large. If this does not hold, the housing market still substantially operates as a unitary market. If the difference in standard errors between the stratified and unstratified models is less than 10 %, the differences in the price of individual housing attributes have a relatively negligible effect on the overall variation in house prices and the unstratified model will predict the value of housing as effectively as the stratified model (Schnare et al., p. 151). As the difference in standard errors of the stratified and unstratified regression models is larger than 10 % (SE/SE^u = 11,9557 % from table 8.21) the differentials in the prices of the attributes of housing do have a significant effect on the overall variation in housing prices. The geographically stratified model is thus a significantly more effective instrument than the unstratified model to predict the price of housing.

The F-ratio indicates that the White owner-occupied single dwelling submarket within the overall Bloemfontein property market operates as a segmented market. The large and marked difference between the standard errors of the unstratified and stratified regression models, indicates that the variation in the price of housing attributes resulting from this segmentation has a significant effect on the overall variation in housing prices. Both criteria employed (F-test and difference between standard errors) confirm that the White owner-occupied single dwelling submarket can at a further level be disaggregated into a series of quasi-independent but linked submarkets. These submarkets comprise the spatially specific seven social status subareas that result from the propensity of members of a similar social status to spatially cluster together.

The geographical extent and location of these submarkets are defined by the extent and location of these social status subareas. It would at this stage appear that the members of the various social status groups do not value the attributes of housing similarly. This should result in differentiated sector-specific housing attribute price schedules developing for each social group as well as the development of housing prices that do not bear a close relationship between submarkets.

8.4 Evaluation of hedonic price functions and implicit price estimates

The hedonic price equations for the various submarkets are set out in tables 8.25 to 8.31 on pp. 294 to 297.

From table 8.20 the extremely high R^2 values indicate that the limited number of variables selected by the stepwise regression procedure explain a large proportion of the variation in housing prices. In submarket 1, nine variables explain 70,97 % of the variation in house prices, in submarket 2, twenty-two variables explain 86,12 % of the variation, in submarket 3, twenty variables explain 79,98 % of the variation, in submarket 4 nineteen variables explain 78,05 % of the variation, in submarket 5, 65,69 % of the variation is explained by twelve variables, while in submarkets 6 and 7, 88,44 % and 47,84 % of the variation in the price of housing is explained by nine and two variables respectively.

There is a clear increase in the mean predicted price of housing with an increase in social status. Houses in submarket 1, the lowest social status submarket, have the lowest mean predicted price while the houses in submarket 7, the highest social status submarket, have the highest mean predicted price. The social status ranking problem that was experienced previously in respect of submarkets 3 and 4[2] and which led to the conclusion that these two submarkets basically had a similar social status, was reaffirmed by the mean price of housing in these submarkets. There is only a R1 296,00 difference in the mean predicted price of houses located within these submarkets. The differences in the mean predicted price of housing for the other submarkets vary between R10 807 and R41 421.

An unexpected result was the relatively low mean predicted price of the houses situated in submarket 6. From table 8.15 it can however be seen that the houses in this submarket are relatively smaller than those situated in submarket 5 and 7. Owing to the large influence of housing size on the price of housing in the Bloemfontein housing market, this is probably the factor that led to the lower price levels being recorded in submarket 6.

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[2] Refer to p. 223

The most remarkable feature of the hedonic price equations is the clear instability of the coefficients of the equations for the different submarkets. Not one variable is common to all submarket equations. From table 8.22 it can be seen that only three variables (MAREA, TMT84 and DSTYLE) are common to five of the equations, four variables (POOL, OUTBS, COND and FENCE) are common to four of the equations, five variables (OAREA, AIRCON, BURGLR, GARDEN and BORE) are common to three of the equations, fourteen variables are common to two of the equations while twenty variables are significant in only one of the equations but not any of the others.

Although the instability of the beta coefficients might seem peculiar, it was not unexpected. Similar results were recorded by Ball and Kirwin in Bristol (p. 22), Carvalho et al., in Winnipeg (p. 194) and Palm (1978) in San Francisco (p. 215). Carvalho et al., state that: "The instability of the coefficients may be more apparent than real, however, since it is well known in the economic literature that regressions carried out on data for a set of individual cases will usually contain random rather than fixed coefficients" (p. 194).

The instability of the beta coefficients can of course be ascribed to various interacting factors. Firstly, the grouping procedure has reduced the within-group variance of all the variables with the result that all of the submarkets will have different sets of significant variables. The extreme heterogeneity of housing attributes perceived on a city-wide scale is to a large extent eliminated as soon as the housing market is disaggregated by social status. This is due to the

Table 8.22 COMPARISON OF THE COEFFICIENTS SELECTED THROUGH STEPWISE REGRESSION INTO THE VARIOUS HEDONIC PRICE EQUATIONS

Variable	Unstratified model	Stratified model: Submarket 1	Submarket 2	Submarket 3	Submarket 4	Submarket 5	Submarket 6	Submarket 7
MAREA	▣		▣	▣	▣	▣		■
TMT84	▣	▣	▣	■	▣	▣		
DSTYLE	▣	▣		▣	▣	▣	□	
POOL	□			▣	□	□		■
OUTBS	□		▣	□		▣	□	
COND	▣		▣	□	□	▣		
OAREA	▣		▣	▣	▣			
AIRCON	▣		▣	▣			□	
FENCE			▣		▣	▣	▣	
BURGLR	□		□	□	□			
GARDEN	▣		□		▣	□		
BORE			▣	□		▣		
DRAIL	▣		▣	▣				
OROOM	■			▣	□			
ROOF	■		■			■		
FRONT	■	■		■				
PAREA	■			■				
KFIX	■				■			
DEPTH	■	■						
INOC	■		■					
CPORT		■	■					
HEIGHT			■	■				
BATH			▣	■				
GLSZ			▣		■			
TWORK					□	□		
NROOM	▣						▣	
LQLH	▣				▣			
REDL		▣	▣					
HEAT			▣				▣	
BEDR			□			□		
KCUP		□			□			
GARAG	□			□				
SOIL				□			□	
OPM	□			□				
MHOC			□					
DATE	□							
HTYPE	□							
UPAREA					□			
PERCPS					□			
PERCPP				□				
DIV					□			
GRAD							□	
OUTBLD							□	
DIND					▣			
DRIVE		□						
BEDC		□						
DESIGN			□					
HQLAH	□							
HSQT	□							
AGED	□							
VIEW	□							

interaction between the behaviour and decisions of the agents of supply and allocation of housing and the consumers of housing leading to the establishment of homogeneous areas of similar housing. These similar houses are also occupied by households of similar characteristics and housing needs and are, as a result of their specific spatial locations, subjected to similar internalities and externalities. This is supported by the variation in the summary statistics of the various variables expressed in tables 8.15 and 8.16.

The second and probably most important reason for the intersubmarket variability in the regression coefficients of the different submarket equations, is the differing conditions of supply and demand that operate within each of the submarkets. The tendency in Bloemfontein of the White owner-occupiers of housing to seek affiliation with owner-occupiers of housing of a similar social status and the tendency of these groups of households to locate within spatially specific sectors of the greater Bloemfontein urban housing surface, have resulted in households with similar demand functions for housing who value the attributes of housing similarly, to congregate in discrete and locationally specific areas.

Households of different social status attach distinctively different values to the attributes of housing and to the bundle of housing services that flow from these attributes. This is in line with Quigley's finding that the empirical evidence from previous house price studies suggests "that income levels (and demographic characteristics) **of households**[3] strongly affect the

[3] Words added

choice of particular characteristics of 'housing services' and that there are strong cross-price effects in demand" (p. 39).

This results in the generation of different market price functions of housing for the various submarkets (social status areas). Not only are there differences in the implicit prices attached to the attributes of housing, but there are also vast differences in the combination of attributes that do contribute significantly to the price of housing for the various submarkets. The relatively independent interaction between the consumers and suppliers of housing within each submarket has thus resulted in the development of sector-specific housing attribute price schedules as well as sector-specific combinations of the attributes of housing that significantly contribute to the price of housing.

The signs and strengths of the regression coefficients are as expected, save for the exceptions that are discussed below.

The extremely large contribution of the structural and qualitative characteristics of the dwelling as well as those of the site to the price of housing was unexpected. From table 8.23 it is clear that, except for submarket 1, the structural development and physical characteristics of the dwelling and the site are the factors that have the largest influence on the price of housing. The amount of variance added to R^2 by these factors is in all cases larger than ,5000 and in the case of three of the six submarkets, it is larger than ,7500.

The housing market further appears to be extremely sensitive to

Table 8.23 THE AMOUNT OF VARIANCE ADDED TO R^2 BY THE VARIOUS CATEGORIES OF HOUSING ATTRIBUTES

Attribute categories		Submarkets 1	2	3	4	5	6	7
Physical characteristics and structural development	Structural development	,1053	,7314	,7471	,6813	,6194	,8533	,5201
	Site characteristics	,0247	,0344	,0112	,0181	-	,0712	-
Environment characteristics	Physical environment	-	,0145	,0080	,0947	-	-	-
	Social environment	-	,0029	,0039	,0034	-	-	-
	Fiscal environment	,5924	,0761	,0548	,0052	,0396	-	-
Locational and accessibility factors		-	-	-	,0034	,0461	-	-
Institutional behaviour and constraints		,0135	,0028	-	-	-	-	-

variations in the size of dwellings and this is the one factor the importance of which overshadows that of all the other factors. This variable (MAREA) figured as the most important variable in all submarkets except submarkets 1 and 6. In submarket 6 the most important variable is NROOM with an incremental R^2 = ,4222. In submarket 1 the most important variable is TMT84 with an incremental R^2 = ,5924. However, NROOM is an indirect indication of housing size and captures some of the variation of MAREA. The bivariate correlation between MAREA and NROOM is r_{ij} = ,7305. The incremental R^2 of MAREA is 0,6302, 0,5380, 0,5379, 0,3759 and 0,3831 for submarkets 2, 3, 4, 5 and 7 respectively. This variable was also the first variable to enter the regression equation on the stepwise regression procedure for these five submarkets. This supports Berry's observation that the consideration that has the largest influence on a household's choice among houses is the basic characteristics of the house.[4] Households are prepared to pay more for larger homes.

Subsequent to the formulation of housing space needs of a household and the decision about the size of the dwelling required, specific details of the improvements that are desired enter the decision. The large number of variables measuring the qualitative aspects of housing and the site that have entered the regression equation and significantly affect the price of housing support the supposition. The influence of these factors, however, is much smaller than the influence of house size. The squared semipartial correlations (sr^2_i) of these variables are generally much lower than MAREA or any of the other measures of the size of dwellings. These variables also enter the regression equations at

[4] Refer to p. 166

a later stage.

Only after the aforementioned housing requirements have been formulated, do aspects of the specific location of the desired dwelling enter the decision about which house to purchase. This seems to be supported by the low incremental R^2 and the absence of locational, accessibility and environmental variables in the regression equations.

The failure of the variables that measure the physical, social and fiscal environments of dwellings to feature in the stratified hedonic price equations can also be ascribed to the fact that the influence of these factors on the price of housing has already been captured by the process of segmentation of the overall White housing submarket and the disaggregation of this submarket into, at a lower level, a further set of submarkets. The city-wide variability of these factors and its influence on the price of housing have also completely been lost in the stratification process, as can be seen from table 8.24.

The exceptions to the expected direction of the beta coefficients mentioned previously are the negative signs attached to BEDR and BORE in submarket 2, to AIRCON, PAREA, SOIL and PERCPP in submarket 3, to UPAREA, PERCPS and TWORK in submarket 4 and to HEAT, OUTBS and DSTYLE in submarket 6. No logical explanation can be found for these exceptions; these coefficients must therefore be acting as proxies for unmeasured variations.

In the four submarkets of a lower social status - submarkets 1 to 4 - there is a negative correlation between the price of housing and measures of lot size (GLSZ, FRONT, DEPTH and DIV). An increase in lot size has an accompanying decrease in the price of housing in these submarkets. In the higher social status submarkets, lot size does not have an influence on house prices. This may be due to the inhabitants of the higher social status submarkets having more money available to spend on the upkeep of their properties. The inhabitants of the lower status submarkets obviously do not and thus their housing preferences are accordingly more inclined to smaller lots.

The total municipal tax paid in 1984 (TMT84) was initially postulated as an appropriate measure of the influence of the fiscal environment of housing on the price of housing. It was expected that higher levels of taxation should lead to lower housing price levels. This, however, was not realised and the opposite was perceived. This can be ascribed to the fact that over and above the taxation levels that TMT84 measures, it also measures the total municipal valuation of dwellings. The observed

Table 8.24 RANGES OF THE FACTORS THAT MEASURE THE ENVIRONMENTAL CHARACTERISTICS OF DWELLINGS. CITY-WIDE AND PER SUBMARKET

Variable	City wide	Submarkets 1	2	3	4	5	6	7
PERCPP	,600	,400	,511	,461	,378	,427	,367	,499
HSQT	4,568	1,305	2,488	,976	1,511	1,446	,730	,611
AGED	4,126	2,701	3,253	2,249	2,515	,792	3,254	1,444
LQLH	4,157	3,380	4,157	,059	,078	,262	,235	,040
HQLAH	4,576	,720	1,333	,443	,591	1,978	1,771	,304
INOC	5,417	,477	1,755	2,373	,512	2,059	1,103	2,273
OCED	8,176	1,030	3,413	1,860	1,678	1,302	4,098	6,154
MHOC	6,796	1,534	3,623	2,535	1,249	,933	6,010	1,260
OPM	6,217	2,696	2,305	4,549	3,453	2,709	5,726	1,893
PERCPS	,466	,309	,399	,272	,255	,255	,222	,366
NHD	3,111	2,209	2,314	3,073	2,439	1,013	2,321	,451
PROW	4,133	,626	2,724	2,166	1,659	3,341	2.644	,123

relationship is thus correct as there should be a positive relationship between municipal value and market price. However, if a hedonic model of house prices should be generated for an urban area in which differentiated intra-area effective tax rates are levied, the expected negative relationship between taxation levels and house price levels might be observed - provided that the municipal valuation surface is equitable throughout the urban area.

In general the locational and accessibility factors did not have a significant effect on the price of housing. The only accessibility parameter that did figure in any of the price equations was TWORK (distance to the head of the household's work place). This variable only appears in the price equations of submarkets 4 and 5. The sr^2_i of TWORK is however very small in both areas, being ,0461 and ,0034 for submarket 4 and 5 respectively.

The probable reasons for the insignificance of the distance parameters are firstly, the relatively small size of Bloemfontein. No household therefore is located very far from either the CBD, the head of the household's work place or the nearest shopping centre. The furthest that any dwelling is situated from the CBD is 7 240 meters, the furthest from the nearest shopping centre is 5 100 meters, while 95,5 % of all households are situated at the most within 20 minutes from the head of the household's work place. The rest of the household heads work outside the greater Bloemfontein area and the distance to their work place would not have influenced the relative intra-urban location or price of the dwelling that they purchased.

Table 8.25 HEDONIC PRICE EQUATION FOR STRATIFIED HOUSING MODEL SELECTED THROUGH STEPWISE REGRESSION: SUBMARKET 1

Variable	Estimated coefficient	Standard error of estimated coefficient	Standardised estimated coefficient	t-value	Incremental R^2	Entry level
TMT84	97,59837	14,18955	,69484	6,878	,5924	1
DSTYLE	1 399,43953	819,18113	,11551	1,708	,0078	7
FRONT	-105,08344	71,27164	-,10941	-1,474	,0063	9
DEPTH	-275,55002	112,32381	-,19034	-2,453	,0184	4
CPORT	19,41305	8,92687	,12261	2,175	,0106	6
REDL	36,56798	22,50741	,11524	1,625	,0135	5
KCUP	35,09535	18,83547	,12457	1,863	,0081	8
DRIVE	2 699,66910	1 412,82999	,11539	1,911	,0518	2
BEDC	23,19963	18,81256	,08189	1,233	,0270	3
CONSTANT	22 953,37727	4 528,76553		5,068		

Table 8.26 HEDONIC PRICE EQUATION FOR STRATIFIED HOUSING MODEL SELECTED THROUGH STEPWISE REGRESSION: SUBMARKET 2

Variable	Estimated coefficient	Standard error of estimated coefficient	Standardised estimated coefficient	t-value	Incremental R^2	Entry level
MAREA	157,28635	27,36381	,33919	5,748	,6302	1
TMT84	51,39959	13,87231	,38367	3,705	,0761	2
OUTBS	76,62417	32,16991	,07731	2,382	,0035	19
COND	2 361,74715	490,89964	,15938	4,811	,0208	5
DAREA	65,55570	24,97202	,09422	2,625	,0031	16
AIRCON	7 105,91377	2 984,20364	,07844	2,381	,0062	9
FENCE	3,56933	2,19430	,05411	1,627	,0020	21
BURGLR	2 997,61423	1 106,30539	,08623	2,710	,0064	11
GARDEN	359,60678	162,96562	,07655	2,207	,0246	4
BORE	-8 234,04843	3 670,73750	-,07083	-2,243	,0028	18
DRAIL	1,64033	,43809	,14865	3,744	,0145	6
ROOF	51,14635	20,14679	,09261	2,539	,0047	13
INOC	-4 142,08921	2 023,74734	-,08736	-2,047	,0029	20
CPORT	25,50263	8,08865	,10765	3,153	,0032	15
HEIGHT	168,13048	52,60123	,14994	3,196	,0300	3
BATH	32,33150	13,65679	,12023	2,367	,0061	8
GLSZ	-7,73989	3,55254	-,16388	-2,179	,0044	14
REDL	119,73023	57,46086	,06925	2,084	,0028	17
HEAT	2 197,34236	1 121,05559	,06526	1,960	,0090	7
BEDR	-3 158,72639	1 106,30539	,08623	2,710	,0070	10
MHOC	2 198,74781	875,33191	,10814	2,512	,0052	12
DESIGN	74,84003	50,75252	,05579	1,475	,0018	22
CONSTANT	-85 039,01305	22 606,66003		-3,762		

Table 8.27 HEDONIC PRICE EQUATION FOR STRATIFIED HOUSING MODEL SELECTED THROUGH STEPWISE REGRESSION: SUBMARKET 3

Variable	Estimated coefficient	Standard error of estimated coefficient	Standardised estimated coefficient	t-value	Incremental R^2	Entry level
MAREA	160,23468	23,22731	,39633	6,899	,5380	1
TMT84	31,98918	10,21810	,14098	3,131	,0548	3
DSTYLE	7 549,65076	2 435,98620	,11783	3,099	,0108	9
POOL	7 301,83865	1 657,41187	,18001	4,406	,0170	8
OUTBS	113,66777	29,51563	,15860	3,851	,0405	4
COND	1 851,31052	568,20216	,15878	3,258	,0128	7
OAREA	134,79002	30,10808	,20280	4,477	,0154	6
AIRCON	-8 017,01850	2 781,91550	-,10908	-2,882	,0091	11
BURGLR	2 620,34079	1 398,00819	,09301	1,874	,0077	10
BORE	3 947,34675	1 571,65545	,10259	2,512	,0044	16
DRAIL	2,43626	,85068	,17590	2,864	,0036	18
OROOM	1 067,09800	508,53199	,12959	2,098	,0592	2
FRONT	-60,94645	29,15953	-,08310	-2,090	,0036	14
PAREA	-137,45828	56,37897	-,10749	-2,438	,0064	12
HEIGHT	236,10874	63,02743	,21505	3,746	,0034	15
BATH	31,06260	12,45391	,11195	2,494	,0206	5
GARAG	14,48697	9,04389	,07656	1,602	,0052	13
SOIL	-2 502,61832	1 458,77607	-,08462	-1,716	,0042	17
OPM	1 888,96716	1 071,02710	,10232	1,764	,0039	20
PERCPP	-15 096,63762	7 706,39595	-,10246	-1,959	,0044	19
CONSTANT	-121 751,0260	25 078,56201		-4,855		

Table 8.28 HEDONIC PRICE EQUATION FOR STRATIFIED HOUSING MODEL SELECTED THROUGH STEPWISE REGRESSION: SUBMARKET 4

Variable	Estimated coefficient	Standard error of estimated coefficient	Standardised estimated coefficient	t-value	Incremental R^2	Entry level
MAREA	116,94397	28,29624	,23137	4,133	,5379	1
TMT84	83,67675	14,98582	,52388	5,584	,0052	11
DSTYLE	18 699,79566	3 974,86736	,19293	4,705	,0090	7
POOL	10 853,54835	2 316,13348	,1687	4,686	,0496	3
COND	1 235,50974	678,91397	,08331	1,820	,0062	10
OAREA	78,22577	34,50742	,08489	2,267	,0230	5
FENCE	4,29119	2,27655	0,9388	1,885	,0033	19
BURGLR	2 132,38806	1 093,49125	,07308	1,950	,0045	13
GARDEN	444,11603	206,71246	,10013	2,148	,0041	9
OROOM	1 100,15791	417,12948	,11760	2,637	,0086	8
KFIX	49,99573	10,61059	-,15691	4,712	,0289	4
GLSZ	-17,03452	3,48850	-,28842	-4,883	,0154	12
TWORK	-129,18829	60,80020	-,07200	-2,125	,0034	18
LQLH	-42 033,00332	22 962,70805	-,06986	-1,830	,0130	6
KCUP	29,35213	16,10679	,05786	1,822	,0031	16
UPAREA	-128,33864	46,85925	-,09729	-2,739	,0031	14
PERCPS	-18 471,04087	8 728,97087	-,08742	-2,116	,0034	15
DIV	-8 583,19470	3 909,86345	-,07990	-2,125	,0027	17
DIND	,80767	,60799	,07402	1,328	,0817	2
CONSTANT	-79 224,54078	22 677,65247		-3,494		

Table 8.29 HEDONIC PRICE EQUATION FOR STRATIFIED HOUSING MODEL SELECTED THROUGH STEPWISE REGRESSION: SUBMARKET 5

Variable	Estimated coefficient	Standard error of estimated coefficient	Standardised estimated coefficient	t-value	Incremental R^2	Entry level
MAREA	136,72754	46,23952	,24415	2,957	,3759	1
TMT84	53,31761	18,93157	,25102	2,816	,0386	3
DSTYLE	11 765,81170	3 954,34106	,22792	2,975	,0735	2
POOL	7 758,69288	3 419,28988	,15107	2,269	,0232	6
OUTBS	134,42161	64,17856	,14877	2,094	,0120	10
COND	5 041,41284	1 762,37222	,19953	2,861	,0126	8
FENCE	17,83690	7,44005	,16553	2,397	,0169	7
GARDEN	1 868,52314	599,21118	,23724	3,118	,0666	4
BORE	12 375,69824	6 085,94303	,14154	2,033	,0186	9
ROOF	78,78656	49,62174	,10831	1,588	,0099	12
TWORK	660,58248	185,26661	,25932	3,566	,0461	5
BEDR	5 147,57495	2 969,75055	,12208	1,733	,0102	11
CONSTANT	-99 234,54868	19 578,59402		-5,069		

Table 8.30 HEDONIC PRICE EQUATION FOR STRATIFIED HOUSING MODEL SELECTED THROUGH STEPWISE REGRESSION: SUBMARKET 6

Variable	Estimated coefficient	Standard error of estimated coefficient	Standardised estimated coefficient	t-value	Incremental R^2	Entry level
DSTYLE	-15 448,51826	6 927,12401	-,28940	-2,230	,0180	8
OUTBS	-268,61470	78,89480	-,29541	-3,405	,0294	6
AIRCON	13 362,27830	6 337,40998	,18909	2,108	,1795	2
FENCE	16,46756	6,12734	,21943	2,688	,0620	4
NROOM	11 322,68691	2 059,36525	,54337	5,498	,4222	1
HEAT	-19 093,44595	3 732,11855	,42959	-5,116	,1052	3
SOIL	10 794,09799	5 404,39762	,16101	1,997	,0177	9
GRAD	4 689,58064	1 217,90878	,36665	3,851	,0535	5
OUTBLD	7 001,13136	2 222,55243	,38194	3,150	,0370	7
CONSTANT	36 499,37978	24 191,77076		1,509		

Table 8.31 HEDONIC PRICE EQUATION FOR STRATIFIED HOUSING MODEL SELECTED THROUGH STEPWISE REGRESSION: SUBMARKET 7

Variable	Estimated coefficient	Standard error of estimated coefficient	Standardised estimated coefficient	t-value	Incremental R^2	Entry level
MAREA	345,56739	120,13224	,45462	2,877	,3831	1
POOL	40 069,43324	15 637,18930	,40498	2,562	,1370	2
CONSTANT	16 035,50807	26 071,13797		,615		

The second reason for the small influence of the distance and accessibility factors is that any influence that these factors might have had on the price of housing is overwhelmed by the relatively large contribution of the structural and qualitative characteristics of housing to the price of housing. This is in line with Bourne's view[5] and the findings of Carvalho et al., in Winnipeg and Kain and Quigley's findings in St. Louis.[6]

The influence of redlining practices on the price of housing is limited to submarkets 1 and 2 - the lower social status submarkets. In these submarkets the non-availability of credit or the larger down-payment required leads to a reduction in the price of housing. The importance of this variable in influencing the price of housing does, however, differ considerably between the submarkets. The incremental R^2 of REDL for submarket 1 is ,0135 and for submarket 2 is ,0028. The relative importance of REDL in submarket 1 and not the other submarkets is due to the large proportion (51,5 %) of houses in this submarket for which financing is not available. The lack of financial support for such a large proportion of houses reduces the bargaining power of the owners of housing in this submarket. If they should enter the housing market, they must accordingly keep the price level of their homes relatively low to attract potential housing consumers. The lowered prices attract lower income and lower social status households. This reduces or at least keeps the social status of this submarket at a low level which again places a ceiling on the negotiable price of housing.

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[5] Refer to p. 173
[6] Refer to p. 173

8.4 Summary

The first important implication of the preceding analyses is that the White owner-occupier single dwelling submarket of the overall Bloemfontein property market is segmented by social status. This is the result of the propensity of households of a similar status to congregate in spatially distinct and separated subareas of the urban area. An F-test showed that the null hypothesis that a single population plane for all social status areas combined is the true plane and that a geographically unstratified model of house prices gives better estimates of the price of housing, can be rejected. Not only were there significant differences in the sets of coefficients, but the differential in the prices of the individual housing attributes relative to the overall variation in housing prices was also large, being in excess of 10 %. The division of the housing market into social status groupings thus significantly reduced the squared errors of estimation and significantly improved the prediction of house prices.

The second important conclusion was that weak cross-price elasticities between the submarkets resulted in the submarkets being characterised by independent price equilibria. The strength of the coefficients differs for the submarkets because of the importance of different sets of attributes accounting for housing prices in particular submarkets. The importance of specific attributes in the hedonic price equations thus seems to be a function of the peculiar composition of the submarket and of the variability in each submarket of the attributes of housing.

The failure of the environmental attributes to emerge in the submarket hedonic price equations does not imply that these factors do not have a significant influence on the price of housing. With the disaggregation of the White housing submarket into a further set of submarkets, the influence of these factors on the price of housing is captured by the disaggregation process. They could thus not feature in the submarket hedonic price equations.

Owing to the relatively small size of Bloemfontein and the uniform spatial distribution of public services in Bloemfontein, locational and accessibility factors do not have a significant effect on the price of housing. The only accessibility parameter that was distinguished was the time distance to the head of the household's work place. This variable was only taken up in the regression equations of two submarkets, but the sign of this coefficient differed in the equations.

CHAPTER 9

VALUATION PERFORMANCE AND SYNTHESIS

A major concern of society has been the identification and subsequent eradication of fiscal injustices and inequities. This implies the design of instruments and implementation of reforms that will effectively maintain and preserve fiscal equity. One of the major sources of fiscal inequity, at local governmental level, is the poor execution of the valuation function.

In the first section of this chapter the valuation task performance of the Bloemfontein City Valuer is assessed. The performance of the housing price model as valuation implement is also tested and appraised against the performance of the City Valuer.

The second section of the chapter is devoted to a review and synthesis of the major findings of the study. Recommendations in respect of the present valuation procedure are also forwarded.

9.1 Hypotheses

The following hypotheses with regard to the regressivity of the property tax in Bloemfontein and Langenhoven Park, the incidence of vertical and horizontal valuation bias that is exhibited by the Bloemfontein City Valuer, and the housing price model as a neutral and successful valuation implement, are postulated:

9.1.1 The property tax that is levied in Bloemfontein and

Langenhoven Park is regressive to personal income. There is thus a negative relationship between the income of households and the percentage of this income that is used to pay the property tax.

9.1.2 The regressivity of the property tax in Langenhoven Park is a result of the fixed amount of the tax that is levied on the property owners. Under such a system of taxation, the ability of property owners to pay the tax, is not taken into consideration.

9.1.3 The regressivity of the property tax in Bloemfontein is the result of the vertical valuation bias that the City Valuer exhibits in favour of higher priced properties.

9.1.4 The City Valuer of Bloemfontein exhibits a systematic valuation bias in favour of higher priced properties. Vertical valuation inequities are thus present in Bloemfontein and there is a systematic negative relationship between the assessment ratios of dwellings and the price of dwellings.

9.1.5 The City Valuer of Bloemfontein exhibits a systematic valuation bias in favour of dwellings situated in high social status housing submarkets. Horizontal valuation inequities are thus observable in Bloemfontein and dwellings of a similar price class are systematically valued lower with an increase in the social status of the submarket in which the dwellings are situated.

9.1.6 The housing price model maintains a neutral valuation bias. Vertical and horizontal valuation inequities are thus not observable in the market value valuations generated by the housing price model.

9.2 Property tax incidence

The regressive nature of the property tax noted by Netzer in his study of various cities in the United States of America and by T.R. Smith in his Hartford study is also present in Bloemfontein and Langenhoven Park (Netzer, 1966, p. 264; Smith, T.R., 1972, p. 25). There are significant systematic income-related variations in the proportion of the income of households or the proportion of the income of heads of households that is paid in respect of property taxes.

The lower the personal income of the household or the head of the household, the higher the percentage of the income that is expended on property taxes. The regressive nature of the property tax can clearly be discerned in tables 9.1, 9.2 and 9.3.

In Bloemfontein, households with incomes of R9 999 or less per annum use 5,67 % of their incomes to pay property taxes while in Langenhoven Park the lowest income households use 3,24 % of their incomes in the payment of property taxes. In both Bloemfontein and Langenhoven Park there is a progressive reduction in the percentage of the income that is used to pay property taxes as the income of the households or the income of the heads of households increases. Households with the highest incomes in Bloemfontein and Langenhoven Park on average only use ,55 % and ,67 % of their incomes, respectively, to pay property taxes. In comparing the lowest income grouping of households with the highest income grouping, it was found that the former, in the case of Bloemfontein and Langenhoven Park respectively, paid property taxes that amounted to 10,31 times and 4,84 times the proportion of income paid by the latter. Property taxes levied on single dwelling units in both Bloemfontein and Langenhoven Park are thus regressive to personal income.

Although, on the surface, the preceding figures may suggest otherwise, the incidence of property tax regressivity is more extreme in Langenhoven Park than Bloemfontein. In a direct comparison between the incidence of property tax in the two areas, the lowest and highest household income groupings of Bloemfontein cannot be taken into consideration as no household in Langenhoven Park earns less than R10 000 or more than R100 000 a year. The proportion of the household income that is used to

Table 9.1 HOUSE PRICES, PROPERTY TAX AS PERCENTAGE OF INCOME AND RATIO OF HOUSE PRICE TO INCOME: STUDY AREA

Income categories	Head of household gross income			Family gross income		
	House price	Property tax as % of income	Ratio of price to income	House price	Property tax as % of income	Ratio of price to income
0 - 9 999	60 589	6,48	8,74	66 073	5,67	7,49
10 000 - 19 999	56 447	2,28	3,47	55 029	2,23	3,45
20 000 - 24 999	64 009	1,92	2,85	61 630	1,83	2,75
25 000 - 29 999	69 324	1,71	2,55	62 440	1,51	2,25
30 000 - 34 999	77 626	1,62	2,46	69 374	1,45	2,15
35 000 - 39 999	85 927	1,49	2,35	72 473	1,29	1,96
40 000 - 49 999	95 516	1,34	2,18	84 566	1,22	1,93
50 000 - 59 999	114 135	1,31	2,20	94 723	1,07	1,76
60 000 - 69 999	118 705	1,17	1,92	102 522	,97	1,64
70 000 - 99 999	157 832	1,10	1,97	113 568	,99	1,44
≥100 000	88 625	,50	,66	106 900	,55	,84

Table 9.2 HOUSE PRICES, PROPERTY TAX AS PERCENTAGE OF INCOME AND RATIO OF HOUSE PRICE TO INCOME: BLOEMFONTEIN

Income categories	Head of household gross income			Family gross income		
	House price	Property tax as % of income	Ratio of price to income	House price	Property tax as % of income	Ratio of price to income
0 - 999	60 589	6,48	8,74	66 073	5,67	7,49
10 000 - 19 999	56 184	2,22	3,47	54 317	2,14	3,40
20 000 - 24 999	64 164	1,88	2,86	61 598	1,81	2,75
25 000 - 29 999	69 701	1,68	2,56	62 428	1,44	2,25
30 000 - 34 999	78 023	1,63	2,48	69 905	1,44	2,17
35 000 - 39 999	86 194	1,49	2,36	72 836	1,29	1,98
40 000 - 49 999	98 050	1,37	2,23	85 652	1,22	1,96
50 000 - 59 999	114 135	1,31	2,20	96 733	1,09	1,80
60 000 - 69 999	118 705	1,17	1,92	104 430	,99	1,68
70 000 - 99 999	157 832	1,10	1,97	121 106	,94	1,52
≥100 000	88 625	,50	,66	106 900	,55	,84

Table 9.3 HOUSE PRICES, PROPERTY TAX AS PERCENTAGE OF INCOME AND RATIO OF HOUSE PRICE TO INCOME: LANGENHOVEN PARK

Income categories	Head of household gross income			Family gross income		
	House price	Property tax as % of income	Ratio of price to income	House price	Property tax as % of income	Ratio of price to income
0 - 9 999	-	-	-	-	-	-
10 000 - 19 999	59 744	2,98	3,56	62 959	3,24	4,09
20 000 - 24 999	62 871	2,22	2,78	62 547	2,22	2,75
25 000 - 29 999	66 499	1,93	2,45	62 498	1,82	2,25
30 000 - 34 999	65 862	1,56	2,03	64 720	1,59	1,97
35 000 - 39 999	81 325	1,37	2,22	64 855	1,33	1,71
40 000 - 49 999	80 311	1,15	1,83	60 675	1,15	1,39
50 000 - 59 999	-	-	-	81 993	,92	1,50
60 000 - 69 999	-	-	-	88 529	,78	1,38
70 000 - 99 999	-	-	-	72 110	,67	,95
≥100 000	-	-	-	-	-	-

pay property taxes for the corresponding lowest and highest income groupings is:

for the lowest income grouping: Bloemfontein 2,14 % and Langenhoven Park, 3,24 %; and

for the highest income grouping: Bloemfontein ,94 % and Langenhoven Park ,67 %.

In Bloemfontein the proportion of household income that is used to pay property taxes is 2,28 times greater for households with incomes ranging from R10 000 to R19 999 a year than for households with incomes ranging from R70 000 to R99 999 a year. The corresponding figure for Langenhoven Park is 4,84.

Further evidence of the greater regressivity of the property tax in Langenhoven Park than Bloemfontein is the greater group-by-group reduction, in Langenhoven Park, of the percentage of the household income that is used to pay property taxes. Not only do these percentages start at a higher level in Langenhoven Park, but they also end at a lower level.

In Langenhoven Park the regressivity of the property tax per sé, as well as its greater regressivity, is the direct result of the fixed amount of property tax that is levied on the owners of fixed property in this area, irrespective of the valuation of their properties or their ability to pay. In contrast, by basing the property tax on the valuation of fixed property in Bloemfontein, the ability to pay the tax is to a certain extent taken into consideration and accordingly property tax regressivity is much less in Bloemfontein.

In Bloemfontein different factors give rise to property tax regressivity.

In Bloemfontein property tax regressivity is the result of, among other things, the interaction between the values of housing and income of households, and the fact that the property tax is a proportional tax. From table 9.2 it is clear that the value of housing increases at a much lower rate than does income. The result is that households with larger incomes occupy homes of which the values are proportionally not as high as their incomes. The highest household income grouping has a mean income that is eleven times larger than the mean income of the lowest household income grouping. At the same time, however, the highest household income grouping occupies homes of which the mean value is only 1,62 times higher than the mean value of the housing of the lowest household income grouping. Similarly, for instance, households with incomes ranging from R35 000 to R39 999 (mean income of R37 499,5) earn 1,36 times as much as households with incomes ranging from R25 000 to R29 999 (mean income of R27 499,5). In this case the higher household income grouping occupies housing that is only 1,13 times higher in value than the housing of the lower household income grouping. Similar comparisons between the other household income groupings produce similar results.

The consequence of the differing rates of increase in the value of housing and income is of course aggravated by the fact that the property tax is a proportional tax with no progression built in. A larger proportion of the income of lower income households is thus paid in respect of property taxes than is the case for higher income households.

9.3 Valuation performance

The second reason for property tax regressivity and other inequities in the property tax is shortcomings in the administrative quality of the valuation function - that is, the poor administration and execution of the valuation function.

The traditional method that has been used to appraise the performance of property valuers, is to evaluate the ratio of assessed values to market value or sales price (the assessment ratio), to evaluate the distribution of the assessment ratio around its mean or median and to search for intrajurisdictional non-uniformity of the ratio.

There are differences in opinion as to whether the mean or median of the assessment ratio and coefficient of dispersion (in the case of the median) or coefficient of variation (in the case of the mean) should be used in assessment ratio analyses. Arguments have been presented by various researchers as to which measure is preferable (Behrens, p. 127; Geraci et al., p. 236; Reinmuth, 1976 [a], p. 115).

An initial investigation of the assessment ratio, by sales price category and by submarket, revealed that the ratio was normally distributed for the various categories. In this study the mean is thus used in the assessment ratio analyses. This is in contrast to the median that has been used by Geraci and Plourde, by Downing, and by Plattner, but similar to Thrall, Behrens, Black, T.R. Smith and Reinmuth who have used the mean (Black, p. 205; Behrens, p. 127; Downing, p. 106; Geraci et al., p. 236; Plattner, p. 18; Reinmuth, 1976[a], p. 115; Smith, T.R., 1972, p. 28; Thrall, 1979[a], p. 127).

Researchers also differ as to whether the fractional assessment ratio or the reciprocal of the fractional assessment ratio should be used in the evaluation of valuation performance. The majority of researchers have elected to use the fractional assessment ratio. T.R. Smith (1972) and Cheng (1970[a]) have, however, presented arguments to the effect that the fractional assessment ratio is the statistically more appealing measure (p. 27; p. 50). Notwithstanding, the fractional assessment ratio is used in this study. The fractional assessment ratios are further expressed as percentages. This is done to indicate at what percentage of the full market value or full selling price the property tax valuations and housing price model valuations are fixed.

Assessment ratio analyses are undertaken in respect of the presently operative local authority valuations[1] as well as the valuations determined by the stratified housing price model. This is done, firstly, to determine whether vertical or horizontal valuation inequities exist in respect of single-family housing and secondly, to evaluate the performance and effectiveness of the housing price model as a valuation implement. At the time of

[1] The present City Valuer of Bloemfontein was appointed after completion of the valuation roll that is analysed in the study and was not responsible for any of the valuations.

the research, valuations which serve as the basis for property taxes, have not yet been determined in Langenhoven Park. The assessment ratio analysis to evaluate the performance of the local authority valuer is thus of necessity confined to Bloemfontein. To evaluate the performance of the housing price model, assessment ratio analyses are undertaken for Bloemfontein and Langenhoven Park separately as well as for the two areas combined in respect of the valuations calculated by the model.

Each dwelling was classified according to two classifications: the seven submarkets that had been identified and ten price categories that ranged from R10 000 to more than R150 000. Seventy cells were thus distinguished and each dwelling was placed into one of the cells. The mean, standard deviation and coefficient of variation of the assessment ratio were calculated for each cell for the local authority valuations and the housing price model valuations. In addition, the preceding statistics were also calculated for the various submarkets and price categories.

These statistics are set out in tables 9.4, 9.5, 9.6 and 9.7. The last column in each table summarises the assessment ratios by submarket while the eighth group of rows summarises the assessment ratios by price class.

9.3.1 Valuation performance: Municipal valuations

Table 9.4 contains the relevant statistics that are used to evaluate the level of execution of the valuation function by the City Valuer.

The mean assessed value to sales price ratio of 72,0721 % on a city-wide scale (the cell at the extreme right and bottom of table 9.4) indicates that the municipal valuations of single-family dwellings are not equal to their market value. The municipal valuations are on average approximately 18 % less than full market value. This was not unexpected and does not indicate that the valuer has inherently valued single-family housing incorrectly. The reasons why municipal value seldomly equals market value in the Orange Free State have been fully discussed in chapter 3.[2]

However, what is important is that the valuer should maintain a constant level of assessment performance. This implies that the variability in the assessment ratio should be as small as possible and that a constant assessment ratio should be maintained throughout the valuation surface. The standard deviation and coefficient of variation are two measures that can be used to great effect to evaluate valuation performance. The higher the standard deviation or coefficient of variation of the assessment ratio, the greater the variation in assessment ratios and consequently the greater the inequity in valuation and in taxation among properties.

The coefficient of variation of 18,3348 indicates that there is a large variability in assessed values. This is supported by the large range of assessment ratios that varies from a minimum of 31,81 % to a maximum of 134,25 %. An unacceptably small proportion of assessment ratios will thus be located close to the

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[2] Refer specifically to p. 108

Table 9.4 ASSESSMENT-SALES PRICE RATIO, STANDARD DEVIATION, COEFFICIENT OF VARIATION AND FREQUENCIES FOR SUBMARKETS AND HOUSING PRICE CATEGORIES: BLOEMFONTEIN

Price category Submarket	10 000 - 29 999	30 000 - 39 999	40 000 - 49 999	50 000 - 59 999	60 000 - 69 999	70 000 - 79 999	80 000 - 89 999	90 000 - 99 999	100 000- 149 999	150 000 and higher	Submarket averages
1	75,3259	67,5433	57,9533	66,7392	64,9556	65,0205	54,6341	-	-	-	63,7602
	22,0199	10,9530	13,0113	12,3533	13,5868	,3751	-	-	-	-	13,9917
	29,2328	16,2163	22,4514	18,5098	20,9171	,5769	-	-	-	-	21,9443
	7	10	38	32	11	2	1	-	-	-	101
2	95,4094	66,8066	64,4679	71,0605	72,9134	75,5588	65,8260	64,8727	60,4000	-	70,0153
	1,9329	6,7491	12,3289	13,2607	9,6863	7,3986	5,5625	6,5595	-	-	11,7799
	2,0259	10,1024	19,1241	18,6611	13,2847	9,7918	8,4503	10,1113	-	-	16,8248
	4	11	37	35	40	13	12	5	1	-	158
3	-	-	74,7727	76,5423	70,8851	70,4003	67,8679	65,9569	60,9724	-	69,9618
	-	-	,3214	7,6251	9,6543	10,5825	7,4019	6,9075	6,2831	-	9,4094
	-	-	,4298	9,9619	13,6196	15,0319	10,9063	10,4727	10,3048	-	13,4493
	-	-	2	9	36	30	13	13	4	-	107
4	-	-	91,8714	83,6553	81,7791	78,9368	79,5684	73,2054	67,3013	-	80,1321
	-	-	22,4221	11,1075	9,4856	9,2793	7,5221	7,5219	7,8232	-	10,2021
	-	-	24,4060	13,2777	11,5991	11,7554	9,4536	10,2751	11,6241	-	12,7316
	-	-	3	42	75	52	36	12	11	-	231

5	-	-	-	127,3214	73,8346	74,2321	74,6012	70,4099	69,3496	58,4548	71,0980
	-	-	-	-	-	14,5471	6,8630	6,8701	12,2047	5,2251	12,5957
	-	-	-	-	-	19,5968	9,1996	9,7573	17,5988	8,9387	17,5957
	-	-	-	1	1	11	17	13	39	6	88
6	-	-	-	65,3866	58,5323	61,4808	67,1975	57,5556	62,7885	50,8824	63,2503
	-	-	-	15,7109	13,5675	6,3089	11,9150	-	-	-	11,0865
	-	-	-	24,0277	23,1795	10,2616	17,7313	-	-	-	17,5280
	-	-	-	3	3	3	8	1	1	1	20
7	-	-	-	-	74,6667	72,3550	90,8559	71,4911	60,3807	50,3324	64,0184
	-	-	-	-	-	15,0882	37,7236	14,9681	12,4299	12,5618	20,1892
	-	-	-	-	-	20,8530	41,5203	20,9370	20,8589	24,9577	31,5366
	-	-	-	-	1	3	3	3	8	8	26
Price category averages	82,6290	67,1574	62,6587	74,9890	75,6913	74,9744	74,1073	69,0984	67,1105	53,6180	72,0721
	19,8675	8,7695	14,4773	14,5557	11,4779	10,7945	11,4073	8,0410	11,4399	10,2655	13,2143
	24,0442	13,0581	23,1050	19,4104	15,1641	14,3976	15,3930	11,6370	17,0464	19,1456	18,3348
	11	21	80	122	167	114	90	47	64	15	731

mean. If an interval equal to plus and minus 5 % about the mean assessment ratio (68,47 % - 75,68 %) is taken, 21,48 % of the assessment ratios lie within this range. If the range is widened to 10 % on either side of the mean (64,86 % - 79,28 %), then 41,59 % of the assessment ratios lie within the range. The large variability in the assessment ratio indicates that there are significant variations in the assessment ratios of properties and that valuation inequities and consequently property tax inequities exist among property owners.

Looking at the across-price-category summary statistics of the assessment ratio, it is clear that substantial vertical valuation inequities exist. A valuation bias towards high priced properties and toward some of the lower priced properties can be clearly discerned.

The assessment ratios of housing in the R90 000 and higher price classes show a steady decrease with an increase in price. The assessment ratios for these price categories are all lower than the mean assessment ratio and vary from 69,098 % to 53,618 %.

The assessment ratios of the lower house price classes (lower than R50 000) also show an extreme variability but this variability does not have a clear systematic progressive or regressive trend. The assessment ratio of the lowest house price category is approximately 15 % higher than the mean assessment ratio. The assessment ratios of the two house price classes that follow also deviate substantially from the mean assessment ratio, but in these cases they are lower.

The assessment ratios of the middle price classes (R50 000 - R89 999) show the smallest deviation from the mean assessment ratio. The assessment ratios of the price categories are very similar and vary between 74,11 % and 75,69 %.

The across-price-category assessment ratio trend indicates that the City Valuer has relatively overvalued housing in the R10 000 - R29 999 price range, has relatively undervalued housing in the R30 000 - R49 999 price range, has valued the large number of houses in the R50 000 - R89 999 price range at relative par and then has systematically undervalued housing with prices ranging from R90 000 and higher. There is also a steady increase in the magnitude of undervaluation as the price of the higher priced housing increases.

The highest coefficients of variation are recorded on the low- and high-priced properties, with those in the middle price range generally lower.

The trend in the deviation of the assessment ratios of the various price classes from the mean assessment ratio and especially the greater coefficients of variation recorded in respect of properties at the ends of the price range, indicate that the City Valuer experienced difficulties in determining the values of dwellings at the lower and higher end of the price scale. A high level of valuation proficiency has thus not been attained in respect of low- and high-priced properties.

The incidence of horizontal valuation inequity exhibits a similar trend as the incidence of vertical valuation inequity. There is an initial undervaluation of dwellings in the lower social status submarkets as indicated by the low assessment ratios. The assessment ratios then increase to a high for submarket 4. This suggests a relative overvaluation of dwellings in this middle social status submarket. The assessment ratios thereafter decrease and are indicative of the relative undervaluation of housing in the higher social status submarkets. The trend of submarket assessment ratios indicates a progressive valuation bias up to submarket 4, which is then followed by a regressive valuation bias. The coefficients of variation for the middle social status submarkets (submarkets 3 and 4) are lowest and gradually increase as the social status of the submarket increases or decreases.

This intrasubmarket variation in assessment ratios and coefficients of variation can be partially explained by the variation in the average sales price of housing per submarket. There is a steady increase in the mean housing sales price with an increase in social status as can be seen from table 8.15. The horizontal valuation inequity trend thus basically mirrors the vertical valuation inequity trend.

To discover explanations for the observed assessment ratio trends as well as the variability of the coefficients of variation, scatterplots of various variables with the assessment ratio were inspected. All variables, except one, either exhibited an inverted u-shaped relationship or no relationship with assessment ratio. The inverted u-shaped relationship was prevalent for all variables that had a positive linear relationship with housing price or social status. Examples of such variables are the various levels of income, education and occupational status.

The variable that was the exception was age of the dwelling. A significant negative linear relationship exists between age of the dwelling and assessment ratio as is displayed in diagram 9.1. This negative relationship indicates that there is a larger measure of undervaluation with an increase in age of the dwelling. This indicates that the valuer systematically overestimates the effect of age on the value of housing and is applying an excessive and incorrect depreciation factor. The reaction of the price of housing to the age of the dwelling is not as sensitive as the valuer anticipates.

The trend of the price category and submarket assessment ratios to deviate from the mean assessment ratio, the variability in the coefficients of variations (especially in respect of low- and high-priced dwellings) and the systematic negative relationship between age of the dwelling and assessment ratio are all indicators of a relatively low level of effective execution of the valuation function by the City Valuer. This is an administrative shortcoming that can be substantially corrected through the application of an efficient assessment procedure.

The variations in the assessment ratios, either by price category or submarket, do not significantly contribute to or accentuate the regressivity of the property tax in Bloemfontein, except for housing at the extreme ends of the price range; that is housing in the R10 000 - R29 999 price range and houses priced at R100 000 and higher. The variations in the assessment ratios do, however, contribute significantly to the inequitable distribution

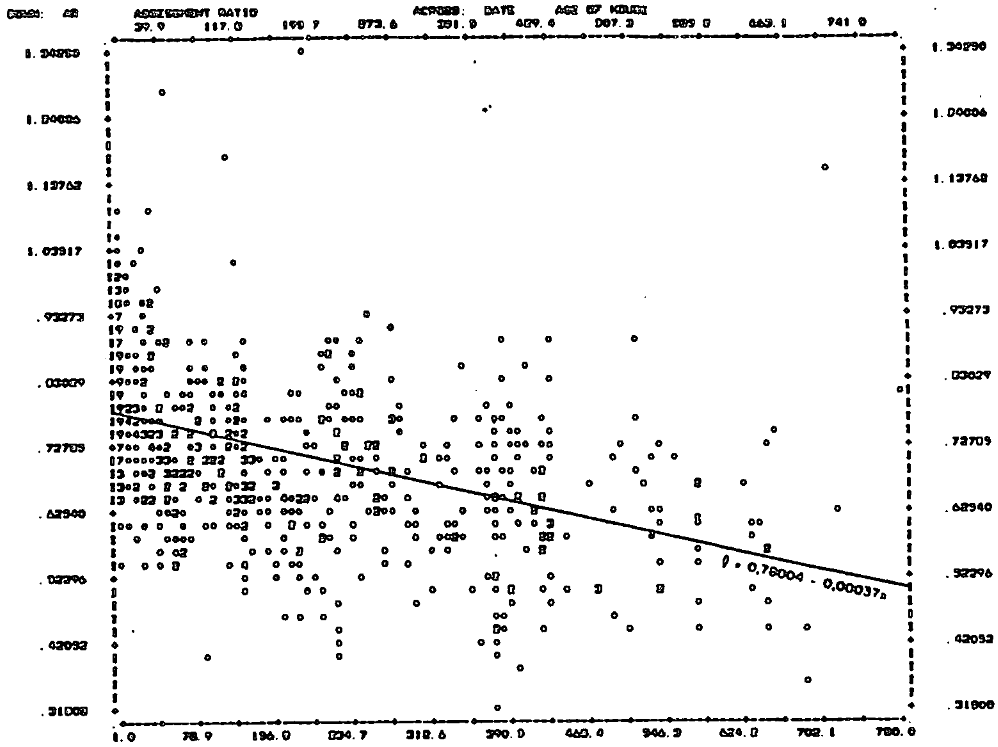

DIAGRAM 9.1 SCATTER DIAGRAM OF ASSESSMENT RATIO AND AGE OF HOUSE

of property taxes.

9.3.2 Valuation performance: housing price model valuations[3]

Tables 9.5, 9.6 and 9.7 contain the relevant statistics that are used to evaluate the performance of the housing price model as a valuation implement.

The housing price model on average tends to fractionally overvalue single-family housing in Bloemfontein and the study area as a whole but to fractionally undervalue housing in Langenhoven Park.

[3] The housing price model valuations will henceforth be referred to as MRA values (multiple regression analysis values).

The variability in the MRA values is much less than in the case of the municipal valuations. The coefficients of variation at 11,4603 % for the whole study area, 11,8311 % for Bloemfontein and 6,0516 % for Langenhoven Park, indicate that a large proportion of the assessment ratios of the MRA values is situated close to the mean assessment ratio. 37,38 % of the assessment ratios for the study area, 36,11 % of the assessment ratios for Bloemfontein and 63,77 % of the assessment ratios for Langenhoven Park are situated in the range plus and minus 5 % about the mean. If the range is widened to plus and minus 10 % about the mean 70,88 % of the assessment ratios for the study area, 69,08 % of the assessment ratios for Bloemfontein and 89,86 % of the assessment ratios for Langenhoven Park lie within the range. The reduced coefficients of variation of the assessment ratio of the MRA values compared to the coefficient of variation of the assessment ratio of the municipal values, indicate that the variability in the MRA values is much less than the municipal values. Valuation inequities are much reduced if the housing price model is used to predict sales price.

The across-price-category assessment ratios show a small degree of regressivity and vertical inequity in respect of the whole study area, Bloemfontein and Langenhoven Park. In Bloemfontein and the study area as a whole, properties that fall in the R10 000 - R29 999 price category have assessment ratios of 135,1196 % while those in the R30 000 - R39 999 price class have assessment ratios of 109,4259 %. This indicates that dwellings in these two categories are overvalued by approximately 33,5 % and 8 % respectively.

Table 9.5 ASSESSMENT-SALES PRICE RATIO OF PREDICTED VALUES, STANDARD DEVIATION, COEFFICIENT OF VARIATION AND FREQUENCIES FOR SUBMARKETS AND HOUSING PRICE CATEGORIES: STUDY AREA

Price category Submarket	10 000 - 29 999	30 000 - 39 999	40 000 - 49 999	50 000 - 59 999	60 000 - 69 999	70 000 - 79 999	80 000 - 89 999	90 000 - 99 999	100 000- 149 999	150 000 and higher	Submarket averages
1	129,2557	111,1857	100,9169	98,6517	91,5240	85,3431	104,5430	-	-	-	101,8845
	20,1909	12,8953	11,5463	9,7003	5,4516	2,8820	-	-	-	-	14,2521
	15,6209	11,5980	11,4414	9,8329	5,9565	3,3770	-	-	-	-	13,9885
	7	10	38	32	11	2	1	-	-	-	101
2	145,3813	107,8262	100,0081	100,8937	98,5977	101,0654	94,8518	97,7216	92,6536	-	101,0472
	5,1018	6,2148	9,9388	10,4413	8,0306	5,9701	5,1553	3,1406	-	-	11,1312
	3,5093	5,7637	9,9380	10,3488	8,1448	5,9072	5,4351	3,2138	-	-	11,0158
	4	11	37	35	42	20	13	5	1	-	168
3	-	-	108,7009	103,9285	100,6341	101,2354	96,9678	95,6817	92,2596	-	100,5814
	-	-	7,4448	8,3547	7,9101	7,1133	8,1979	6,0064	3,3346	-	8,0552
	-	-	6,8489	8,0389	7,8603	7,0265	8,4542	6,2775	3,6144	-	8,0086
	-	-	4	29	57	36	15	14	4	-	159
4	-	-	120,6516	104,8633	101,4907	99,5858	98,5340	95,6101	91,8257	-	100,6974
	-	-	12,2025	10,7116	7,8578	7,5535	6,3307	8,4832	4,4944	-	8,9094
	-	-	101,1138	10,2148	7,7424	7,5849	6,4249	8,8727	4,8945	-	8,8477
	-	-	3	42	75	52	36	12	11	-	231

5	-	-	-	126,2254	98,9454	110,1464	105,4387	103,7748	98,3331	87,3239	101,5596
	-	-	-	-	-	14,7752	12,7119	12,7669	11,9005	4,3404	13,3770
	-	-	-	-	-	13,4141	12,0562	12,3025	12,1022	4,9705	13,1716
	-	-	-	1	1	11	17	13	39	6	88
6	-	-	-	105,0402	95,5049	98,8648	101,9238	98,7038	102,0428	93,7354	100,3381
	-	-	-	13,7471	14,3314	4,8096	8,0854	2,8997	3,5598	-	8,1546
	-	-	-	13,0875	15,0059	4,8648	7,9328	2,9378	3,4885	-	8,1271
	-	-	-	3	3	5	10	3	2	1	27
7	-	-	-	-	118,9793	127,1054	140,3266	91,5017	107,2083	85,8680	105,3996
	-	-	-	-	-	44,4152	47,9182	2,2205	12,1415	13,9942	28,1889
	-	-	-	-	-	34,9436	34,1476	2,4267	11,3251	16,2973	26,7448
	-	-	-	-	1	3	3	3	8	8	26
Price category averages	135,1196	109,4259	101,6085	102,4483	100,0013	101,5673	100,7582	97,9032	97,9712	86,9748	101,1332
	17,8494	9,8538	11,3066	10,3486	8,2646	10,8720	13,1978	9,0216	11,1500	10,4242	11,5902
	13,2101	9,0050	11,1276	10,1013	8,2645	10,7042	13,0985	9,2148	11,3802	11,9853	11,4603
	11	21	82	142	190	129	95	50	65	15	800

Table 9.6 ASSESSMENT-SALES PRICE RATIO OF PREDICTED VALUES, STANDARD DEVIATION, COEFFICIENT OF VARIATION AND FREQUENCIES FOR SUBMARKETS AND HOUSING PRICE CATEGORIES: BLOEMFONTEIN

Price category / Submarket	10 000 - 29 999	30 000 - 39 999	40 000 - 49 999	50 000 - 59 999	60 000 - 69 999	70 000 - 79 999	80 000 - 89 999	90 000 - 99 999	100 000- 149 999	150 000 and higher	Submarket averages
1	129,2557	111,1857	100,9169	98,6517	91,5240	85,3431	104,5430	-	-	-	101,8845
	20,1909	12,8953	11,5463	9,7003	5,4516	2,8882	-	-	-	-	14,2521
	15,6209	11,5980	11,4414	9,8329	5,9565	3,3842	-	-	-	-	13,9855
	7	10	38	32	11	2	1	-	-	-	101
2	145,3813	107,8262	100,0081	100,8937	98,7698	101,7902	94,9869	97,7216	92,6536	-	101,2301
	5,1018	6,2148	9,9388	10,4413	8,1493	5,7915	5,3604	3,1406	-	-	11,3596
	3,5093	5,7637	9,9380	10,3488	8,2508	5,6896	5,6433	3,2138	-	-	11,2216
	4	11	37	35	40	13	12	5	1	-	158
3	-	-	109,4180	105,1494	101,7115	102,0755	97,9774	96,2860	92,2596	-	100,7806
	-	-	2,7420	13,0976	9,1034	7,4426	8,3720	5,7918	3,3346	-	8,8069
	-	-	2,5060	12,4562	8,9502	7,2913	8,5448	6,0152	3,6144	-	8,7387
	-	-	2	9	36	30	13	13	4	-	107
4	-	-	12-,6516	104,8633	101,4907	99,5858	98,5340	95,6101	91,8257	-	100,6974
	-	-	12,2025	10,7116	7,8578	7,5535	6,3307	8,4832	4,4944	-	8,9094
	-	-	10,1138	10,2148	7,7424	7,5849	6,4249	8,8727	4,8945	-	8,8477
	-	-	3	42	75	52	36	12	11	-	231

5	-	-	-	126,2254	98,9454	110,1464	105,4387	103,7748	98,3331	87,3239	101,5596
	-	-	-	-	-	14,7752	12,7119	12,7669	11,9005	4,3404	13,3770
	-	-	-	-	-	13,4141	12,0562	12,3025	12,1022	4,9705	13,1716
	-	-	-	1	1	11	17	13	39	6	88
6	-	-	-	105,0402	95,5049	96,6561	101,3386	102,0228	104,5600	93,7354	100,1315
	-	-	-	13,7471	14,3314	4,5374	8,9581	-	-	-	9,2910
	-	-	-	13,0875	15,0059	4,6944	8,8398	-	-	-	9,2788
	-	-	-	3	3	3	8	1	1	1	20
7	-	-	-	-	118,9793	127,1054	140,3266	91,5017	107,2083	85,8680	105,3996
	-	-	-	-	-	44,4152	47,9182	2,2205	12,1415	13,9942	28,1889
	-	-	-	-	-	34,9436	34,1476	2,4267	11,3251	16,2973	26,7448
	-	-	-	-	1	3	3	3	8	8	26
Price category averages	135,1196	109,4259	101,4491	102,2957	100,2120	101,9086	100,9940	98,1542	97,9530	86,9748	101,2443
	17,8494	9,8538	11,3153	10,9535	8,6097	11,3905	13,4328	9,1862	11,2364	10,4242	11,9783
	13,2101	9,0050	11,1537	107,0768	8,5915	11,1772	13,3006	9,3589	11,4712	11,9853	11,8311
	11	21	80	122	167	114	90	47	64	15	731

Table 9.7 ASSESSMENT-SALES PRICE RATIO OF PREDICTED VALUES, STANDARD DEVIATION, COEFFICIENT OF VARIATION AND FREQUENCIES FOR SUBMARKETS AND HOUSING PRICE CATEGORIES: LANGENHOVEN PARK

	40 000-49 999	50 000-59 999	60 000-69 999	70 000-79 999	80 000-89 999	90 000-99 999	100 000-149 999	Submarket averages
2	-	-	95,1555	99,7194	93,2308	-	-	98,1577
	-	-	5,4022	6,5217	-	-	-	6,1801
	-	-	5,6772	6,5401	-	-	-	6,2961
	-	-	2	7	1	-	-	10
3	107,9838	103,3791	98,7871	97,0351	90,4057	87,8256	-	100,1716
	12,5179	5,4416	4,9493	2,7415	,6546	-	-	6,2896
	11,5924	5,2637	5,0101	2,8253	,7241	-	-	6,2788
	2	20	21	6	2	1	-	52
6	-	-	-	102,1778	104,2649	97,0443	99,5257	100,9285
	-	-	-	3,8425	3,5964	,5411	-	3,7753
	-	-	-	3,7606	3,4493	,5576	-	3,7406
	-	-	-	2	2	2	1	7
Price category averages	107,9838	103,3791	98,4713	98,9735	96,5144	93,9714	99,5257	99,9566
	12,5179	5,4416	4,9689	5,0321	7,3979	5,3362	-	6,0490
	11,5924	5,2637	5,0460	5,0843	7,6651	5,6785	-	6,0516
	2	20	23	15	5	3	1	69

In Bloemfontein and the whole study area, dwellings in the R40 000 to R149 999 price classes have assessment ratios that are relatively similar. In Bloemfontein these assessment ratios vary within a range of 4,3427 percentage points from a maximum of 102,2957 % to a minimum of 97,9530 %. For the whole study area the range is 4,5451 %, from a maximum of 102,4483 % to a minimum of 97,9032 %.

In case of both Bloemfontein and the whole study area, housing in the R150 000 and over price class has an assessment ratio that differs significantly from and is lower than the mean assessment ratio at 86,9748 %. This indicates that dwellings in this price class are undervalued by approximately 14,75 %.

The pattern of variation in the across-price-category assessment ratios in respect of Langenhoven Park indicates that a measure of vertical valuation bias in favour of higher priced housing has been captured by the housing price model. The assessment ratios vary from a high of 107,9838 % to a low of 93,9714 %. The assessment ratios have a generally decreasing tendency with an increase in housing price.

The three price classes in which the majority of houses in Langenhoven Park fall, do not, however, have assessment ratios that vary greatly from the mean assessment ratio. The assessment ratios of dwellings in the price range R50 000 - R79 999 vary within a range of 4,9078 % from a maximum of 103,3791 % to a minimum of 98,4713 %. The maximum difference of any of the assessment ratios from the mean assessment ratio is 3,4225 %. 84,06 % of the houses in Langenhoven Park that were sold fall within these price categories.

The variability in the assessment ratios is generally similar for all price categories. The coefficients of variation for the whole study area vary between 13,2101 % and 8,2645 %; in Bloemfontein they vary between 13,3006 % and 8,5915 % while in Langenhoven Park they vary between 11,5924 % and 5,0460 %. The housing price model thus produces significantly better and more constant across-price-category assessments of housing price than does the City Valuer.

The overvaluation and undervaluation of properties at the extreme ends of the housing price range as well as the greater variability of the assessment ratios of these price classes, are the result of the small number of sales that have taken place at such extreme prices. Owing to the relatively few sales, "average" implicit prices of the attributes of housing, and thus "average" prices of housing, could not be determined for these price classes. 1,38 % of all sales took place in the price range R10 000 - R29 999, 2,63 % of all sales took place in the price range R30 000 - R39 999 and 1,88 % of all sales took place in the price range R150 000 and higher. These percentages are in respect of the study area as a whole. The percentages for Bloemfontein only are slightly higher and the corresponding percentages are 1,50 %, 2,87 % and 2,05 %.

A similar problem exists in respect of Langenhoven Park. Only 7,25 % of the sales took place in the two price categories that deviate by more than 5 % from the mean assessment ratio for the area (the R40 000 - R49 999 and R90 000 - R99 999 price ranges).

An extremely pleasing feature was the complete absence of any horizontal valuation inequity in tables 9.5, 9.6 and 9.7. In table 9.5 the submarket assessment ratios vary from 100,3301 % to 105,3986 %, in table 9.6 they vary from 100,1315 % to 105,3996 %, while in table 9.7 the assessment ratios vary from 98,1577 % to 100,9285 %. This implies a maximum difference of 4,27 % from the mean assessment ratio of the study area as a whole, a maximum difference of 4,16 % from the mean assessment ratio of Bloemfontein and a maximum difference of 1,80 % from the mean assessment ratio of Langenhoven Park.

The coefficients of variation of the assessment ratios for all submarkets, except for submarket 7 in tables 9.5 and 9.6, are reasonably similar. The coefficient of variation for submarket 7 at 26,7448 % is nearly twice as large as the next highest coefficient of variation. This again confirms the earlier observation that the relatively fewer sales in the higher price categories and thus in the higher social status submarkets, prevent the effective formulation of predicted market values of housing that sells at such extreme prices. 3,56 % of the houses that were sold in Bloemfontein and 3,25 % of the houses that were sold in the whole study area, are situated in submarket 7.

Notwithstanding the variability in the predicted prices of housing situated in submarket 7, the absence of any horizontal valuation inequity is very gratifying. This is a direct result of the disaggregation of the housing price model by social status submarket.

The blocked sections of tables 9.4, 9.5, 9.6 and 9.7 contain cells of which the assessment ratio differs by less than 5 % from the area-wide mean assessment ratios. On this level of analysis it would appear that the slight regressivity that was noted in the area-wide analyses is carried through to the submarket level. The housing price model thus, at the submarket level, also overvalues housing at the extreme bottom end of the price range and undervalues properties at the extreme top end of the price range.

Although the housing price model, and indirectly the market value approach to assessment, produce significantly improved assessments of housing value, the model however tends to reflect the average-priced home rather than properties priced above and below the average. Dwellings within the middle price range (R40 000 - R149 999) constitute the majority in most submarkets. In the study area as a whole the dwellings in the middle range constitute 94,13 % of all dwellings; in Bloemfontein they constitute 93,57 % of dwellings while all houses in Langenhoven Park lie within this price range.

A further indication of the significantly improved assessments of the value of housing as produced by the housing price model as against the assessments of the value of housing as produced by the City Valuer, is reflected in diagrams 9.2 and 9.3. These diagrams are scatterplots of the total municipal value against house price and of the total predicted values of the housing price model against house price. Summary statistics to evaluate these relationships are set out in table 9.8.

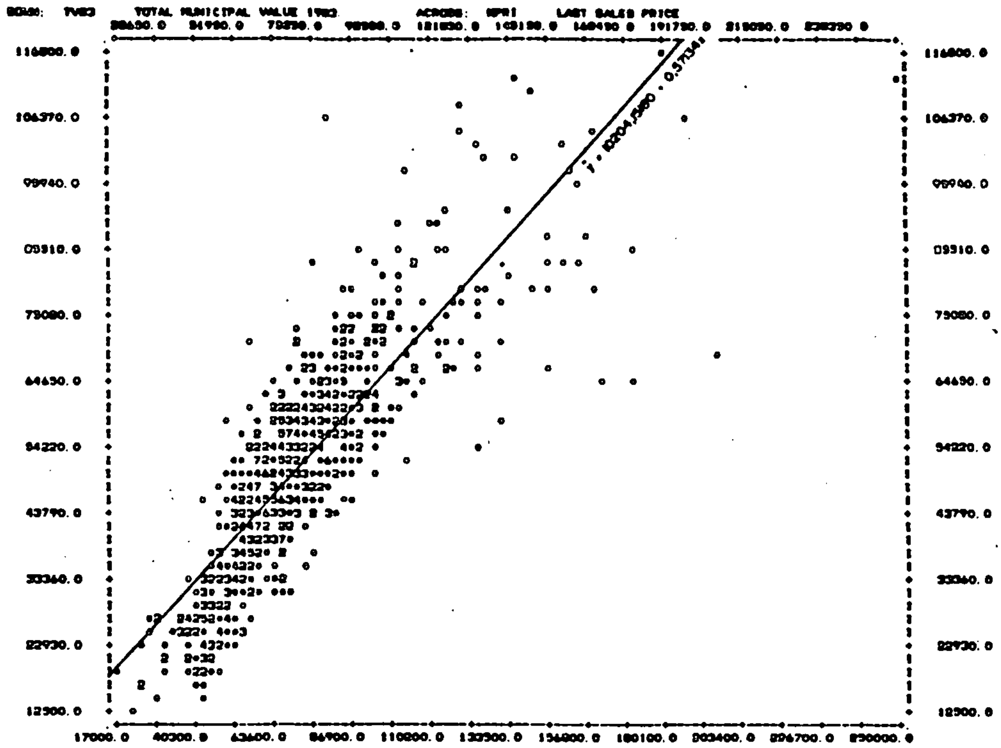

DIAGRAM 9.2 SCATTER DIAGRAM OF LAST SALES PRICE AND TOTAL MUNICIPAL VALUATION 1983

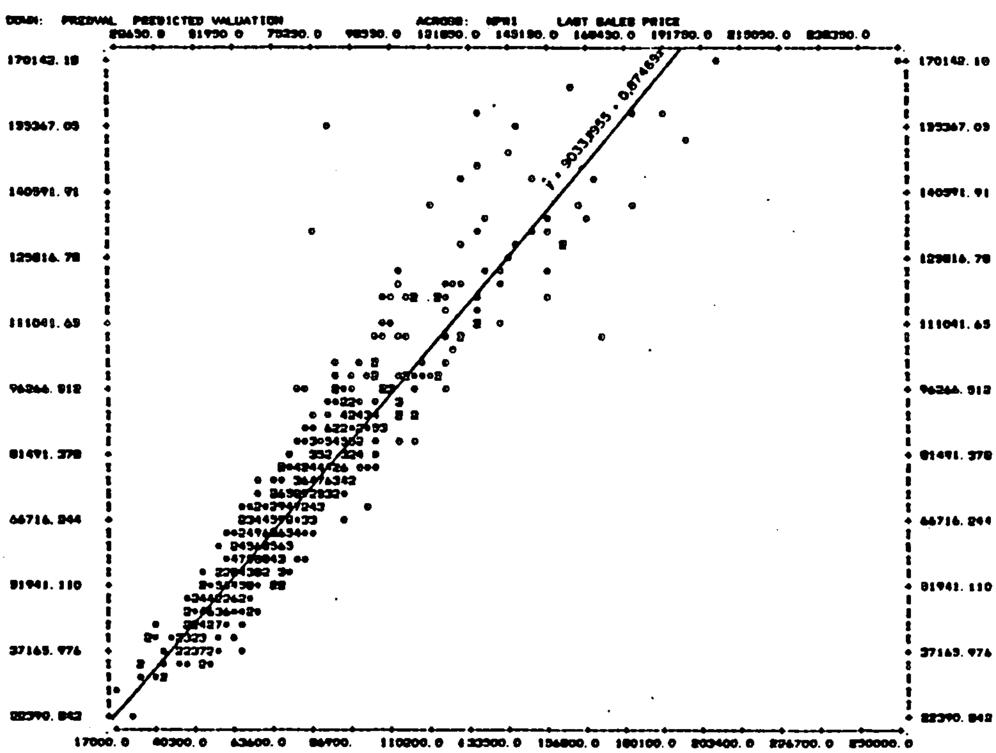

DIAGRAM 9.3 SCATTER DIAGRAM OF LAST SALES PRICE AND PREDICTED VALUATION

Table 9.8 SUMMARY STATISTICS OF THE RELATIONSHIP BETWEEN MUNICIPAL VALUATION AND HOUSE PRICE, AND HOUSING PRICE MODEL VALUATIONS AND HOUSE PRICE: BLOEMFONTEIN

Statistic	Municipal valuations	Housing price model valuations
Correlation coefficient	,83914	,93485
Coefficient of determination	,70416	,87395
Standard error of estimate	9 618,90702	8 628,38994

As can be seen from the diagrams as well as table 9.8, the spread of predicted values around the regression line is significantly less for the housing price model than for the City Valuer. It is especially at the higher end of the housing price range that a vast improvement in value estimation has been effected. The variability in predicted price of housing at the higher end of the housing price range can, however, with an increase in the number of sales analysed, be still further reduced.

From the preceding empirical analysis hypotheses 9.1.1 and 9.1.2 can be confidently accepted. Property tax in Bloemfontein and Langenhoven Park is regressive to personal income. The greater degree of regressivity experienced in Langenhoven Park is a direct result of the fixed amount of property tax levied on all owners of single-family residential properties. The local authority has, subsequent to the study, changed to levying property taxes that are based on the value of fixed property. This will, if the valuer maintains a neutral valuation bias, lead to a reduction in the regressivity of the property tax in this area.

Hypotheses 9.1.3, 9.1.4 and 9.1.5 cannot be accepted. Although the City Valuer does exhibit a vertical or horizontal valuation bias, this bias is not continuously regressive. In other words the vertical and horizontal bias that is present, is not only in favour of dwellings in the higher price ranges or in favour of dwellings situated in the higher social status submarkets. Instead, he exhibits a valuation bias in favour of dwellings at both ends of the price range and social status range. Properties with lower-than-average and higher-than-average prices and dwellings which are situated in lower-than-average and higher-than-average social status submarkets are relatively undervalued. Although the biases do not accentuate the regressivity of the property tax in Bloemfontein, the variation in the across-price-category relative valuations and across-submarket relative valuations does contribute significantly to the inequitable distribution of the property tax. The property tax accordingly does not conform to the principles of fiscal equity.

No horizontal valuation bias, and a slight vertical valuation bias in favour of extremely high-priced properties and adverse to extremely low-priced properties, were identified in the valuations as predicted by the housing price model. The lower variability in the assessment ratios of the housing price categories and submarkets indicated that the housing price model produced superior predictions of value. Hypothesis 9.1.6 can thus be accepted with a large measure of confidence.

9.5 Conclusion

Considered against the background of the national government's policy of the devolution of some of its powers and governmental functions to local governments; the growing call by the inhabitants of urban areas for greater participation in the governmental process and the endorsement by the national government of the principles of the free market system, it is clear that the inhabitants of urban areas will in the future have to be more dependent upon their own resources and own funding to ensure that the welfare of the local community is maintained and to satisfy their specific needs, requirements and aspirations.

The most important independent source of income available to local authorities is the property tax. Although there have been suggestions and evidence that the importance of the contribution of property tax to the full spectrum of local government finances is diminishing, this trend could be reversed in the light of the central government's support for the principle of maximising the self-determination of local authorities. The Honourable P.W. Botha, DMS, MP, former Prime Minister, on 12 October 1983 stated that the government had accepted the principle of the maximum devolution of power and desentralisation of administration to local governments and supported the principle of maintaining a minimum of administrative control over local authorities (The South African Treasurer, November, 1983, p. 5).

A direct result of this policy of devolution of power and administrative functions, is that for local authorities to retain and maintain the increased autonomy, they will have to become less dependent on financial support from central government. This support inevitably leads to central government control and loss of local autonomy.

L.L. Ecker-Racz advises: "Clearly, we cannot abandon the property tax because local government could not survive without it" (Kerrigan, p. 40).

The property tax as the most important independent source of income available to local authorities, and the exploitation of this source of income, should be nurtured to enable local authorities to enjoy the maximum financial benefit offered by the income derived from the taxation of immovable property. The South African local tax on fixed property has proved satisfactory as a revenue-raiser, and current thought should be towards improving its yield rather than abandoning it completely or supplementing it with other sources of income. If not, this would eventuate in greater control by central government, with local government eventually merely becoming an agent of the central government.

Although there has been a continual attack on the property tax as income source - the various defects of the property tax continuously being aired as justification - an acceptable source of income to replace property tax has as yet not been suggested. Few of the exponents of the abolishment of the property tax have made any suggestions which would provide local authorities with a reasonable measure of financial independence and fiscal autonomy with resultant political and administrative autonomy. "Some local authorities frequently complain about the inadequacy and inequity of the local tax on fixed property without first investigating whether many of the disadvantages could not be mitigated by a competently administered and up-to-date system of valuation" (Cowden, p. 75).

A solution to some of the objections experienced in regard to the property tax, lies in the enhancement of the efficiency of the property tax.

A method by which local government can enhance the efficiency of the property tax is by improving the administration of the property tax through upgrading and improvement of the valuation procedure. The improvement of the valuation procedure would result in an equitable distribution and levying of taxes. This would in turn maximise the financial-resource-generating possibilities of property taxation and make the tax politically and economically more acceptable. The present erosion of political and economic autonomy experienced by local governments owing to their increased dependence on the undershoring of their financial base through financial assistance extended by central government, would to a large extent also be reversed.

According to Thrall (1979 [a]): "The paramount impediment to equitable taxes, regardless of the nature or quantity of 'safety valves', is the assessment function" (p. 121).

Improvements to the valuation procedure will result in a spatially neutral valuation policy being maintained by the valuator with vertical and horizontal valuation equity resulting. The relative varying contribution of each property within a certain price and land use category to the total income of local authorities would then not be the result of the valuation process but the result of a political decision by the locally elected representatives who would, through the determination of the randage or differential randage, determine this relative tax contribution. However, the fairness of the valuation will determine the fairness of the randage (Smellie, p. 86).

The goal and obligation of the valuator should be to minimise the spatial variation in the assessment ratio. He must strive to achieve spatial neutrality in his valuations and to exclude any form of bias from his valuations. This can, of course, only be done within the framework of existing technological and modelling techniques and the extent of the local administrative budget. In the absence of the required techniques this goal is, of course, unattainable.

Through the combined application of factor analysis, cluster analysis and multiple regression analysis, it has been possible to construct a prognostic model of the price of single-family housing. This model can successfully be applied as a valuation implement and produces market value valuations that show a high degree of correspondence with observed market prices.

The predictive ability of the model has, however, been further improved by basing the theoretical foundation of the model on the ecological paradigm. The identification, within the larger overall White single dwelling residential submarket of Bloemfontein and Langenhoven Park, of spatially specific submarkets of integrated economic and socio-geographic status into which the owner-occupiers of single-family housing differentiate and the subsequent construction of separate prediction equations for each submarket, lead to the determination of superior estimates of the market value of housing. In comparison to the unstratified model, the geographically stratified model of house prices has superior predictive qualities.

The application of the geographically stratified model leads to the elimination of horizontal valuation inequity and the retention of only a slight measure of vertical valuation inequity. This, however, can be further eliminated by the two-way disaggregation of the house price model: by social status submarket and by house price category.

The attainment of fiscal equity in respect of the property tax is within the reach of all local authorities. Most of the problems and social injustices that accompany fiscal inequity at local governmental level can thus be eliminated. This in turn will lead to a greater trust and reliance being placed in local government as the vehicle through which the just and efficient dispensation of democracy can be accomplished and guaranteed.

"The property tax is the primary source of municipal revenue ... [and it] ... will continue for a long time to be the most important of all municipal revenues. Consequently, it is imperative that it be administered in accordance with the best standard and practices that have been developed" (Municipal Finance Administration, p. 11 as quoted in Kotzé, 1978, p . 143 - 144).

APPENDIX A

DEPENDENT AND INDEPENDENT VARIABLES

DESCRIPTION, NOTATION AND SOURCES OF DATA

LAST SALES PRICE (notation: PRICE) - This is the price that the property fetched at its last sale during the period 1 January 1983 and 31 March 1984. Of the 801 respondents forming the sample, 63 houses were sold twice and two were sold four times within this period. The sales prices were obtained from a search of the registered property transactions at the Bloemfontein Deeds Office. Where a property had subsequently been resold but not transferred, the sales price was obtained from the owner.

AREA OF MAIN BUILDING (notation: MAREA) - The information was supplied by the Bloemfontein City Valuer and in respect of Langenhoven Park, by the Bainsvlei building inspectorate. The area is expressed in square meters and excludes patios, porches and ancillary service buildings such as garages, servant quarters and store rooms. Outbuildings that are under the main roof of the main building are also excluded.

AREA OF OUTBUILDINGS (notation: OAREA) - Same sources as above and also expressed in square meters. Included are all rooms and buildings not included under MAREA except for garages, carports, patios and porches. Wash rooms and store rooms that do not form an integral part of the main living area were included.

AREA OF ROOFED PORCHES (notation: PAREA) - Same sources as for

MAREA and also expressed in square meters. Sun rooms are not viewed as roofed porches but as a portion of the main living area.

AREA OF UNROOFED PORCHES (notation: UPAREA) - Same sources and measurement units as for MAREA. Includes all patios attached to the main building as well as all unroofed interior gardens.

NUMBER OF LIVING ROOMS (notation: NROOM) - Excludes kitchens, breakfast rooms, bathrooms, dressing rooms, pantries, sculleries, entrance halls and wash rooms.

NUMBER OF OTHER ROOMS (notation: OROOM) - Includes the rooms excluded previously, except kitchens and bathrooms.

NUMBER OF BEDROOMS (notation: BEDR) - self explanatory.

NUMBER OF BATHROOMS (notation: BATH) - To eliminate the lack of clarity that exists with regard to the number of bathrooms present in a dwelling (the usual notation is 1, 1½, 2 or 2¾ bathrooms, etc.) all sanitation fixtures (toilet, bath, washbasin, bidet, etc.) are given a value of 33,33, except a shower that has a value of 17. The construction cost of a shower is approximately half that of other sanitation fixtures. The various values are summed to obtain a value of the total bathroom development in the dwelling, irrespective of the number of rooms taken up. In this way a basic bathroom that comprises a bath, washbasin and toilet has a value of 100 and this base value is increased as the bathroom development in the dwelling increases.

NUMBER OF ROOMS IN OUTBUILDINGS (notation: OUTBLD) - All rooms ancillary to the main building but excluding outside bathrooms, toilets, lock-up garages and carports.

NUMBER OF LOCK-UP GARAGES (notation: GARAG) - None = 000 and each parking space in garage = 100. Garage consists of a roofed and walled building with a door.

NUMBER OF CARPORTS (notation: CPORT) - Values similar as for GARAG. Carports include a structure that is walled but does not have a fixed door.

AGE OF DWELLING (notation: DATE) - Indicated in months from date of issue of a building completion certificate by the appropriate local authority. Sources: Bloemfontein City Valuer and Bainsvlei Town Board's building inspectorate in respect of Langenhoven Park.

CONDITION OF DWELLING (notation: COND) - Ordinal variable with the following categories and values in brackets: Dilapidated condition (1), repairs required (2), average condition (3), good condition (4) and new condition (5). Was determined through visual inspection which was correlated with resident to determine whether any improvements or maintenance had been affected since purchase.

HOUSING TYPE (notation: HTYPE) - Dichotomous variable distinguishing between single loose-standing dwellings (1) and semi-detached dwellings (2).

DESIGN OF DWELLING (notation: DESIGN) - Ordinal variable indicating the number of floors of the dwelling. The categories, with the values in brackets, are: Single floor, which includes split levels (100), single and double floor (150), double storey (200) and three storeys (300).

ARCHITECTURAL DESIGN (notation: DSTYLE) - Ordinal variable that indicates the style of design of the dwelling. The categories with their values in brackets are: Dilapidated (1), scheme house (2), adapted scheme house (3), standard design (4) and architecturally designed house (5).

EXTERIOR FINISH (notation: EXT) - An index with a base value of 100 assigned to the cheapest exterior finish. The index values assigned to other types of exterior finish have been calculated based on the additional costs of such finishes, over and above the cost of the cheapest finish. The exterior finishes and their values are: Fair face brickwork (100), painted fair face brickwork (126), painted brick and plaster (128), brick and plaster and face brick (132 to 190 depending on the brick and plaster to face brick ratio), face brick (145 to 211 depending on the type of face brick used).

ROOF COVERING (notation: ROOF) - This in an index with a base value of 100 assigned to the cheapest roof covering. The calculation of the index values assigned to the various roof coverings is based on the additional cost per square meter of using a specific roof covering other than the basic cover. The roof coverings and index values are: corrugated asbestos

(100), IBR (126), Harvey tile (160), Brown built (191), slate (226), thatch (358) and concrete (588).

KITCHEN CUPBOARDS (notation: KCUP) - Ordinal variable with categories and values: None (000), not enough (050) and enough (100) as expressed by the inhabitants of the dwelling.

FIXED WHITE GOODS IN KITCHEN (notation: KFIX) - An indication whether the kitchen has been fitted with any white goods. This is an index with a base value of 100 representing a stove. The construction of the index is based on the capital cost of the goods. The fixtures and values are: hob (50), stove (100), eye-level oven (103), refrigerator (104), freezer (89), refrigerator/freezer combination (125), dish washer (188), washing machine (114), tumble drier (73), stove canopy (28) and microwave oven (156). The total kitchen development is determined by summing the various values.

SANITATION FIXTURES IN KITCHEN (notation: KSAN) - An index that indicates the extent of sanitation fittings in the kitchen or scullery. Single-bowl wash top (100), double-bowl wash top (150), all other additional fittings where a separate water inlet and outlet is involved an additional 100 per item.

BEDROOM WARDROBES (notation: BEDC) - To determine the value of this variable, the extent of the built-in wardrobe development on the scale none = 000, not enough = 050 and enough = 100 was determined for each individual bedroom. The total wardrobe development for the dwelling is the mean of these values.

AIR-CONDITIONING (notation: AIRCON) - Yes = 1, no = 0.

BURGLAR-PROOFING (notation: BURGLR) - Yes = 1, no = 0.

HEATING (notation: HEAT) - Yes = 1, no = 0.

BOREHOLE (notation: BORE) - Yes = 1, no = 0.

SWIMMING POOL (notation: POOL) - Yes = 1, no = 0.

DEVELOPED DRIVEWAY (notation: DRIVE) - Yes = 1, no = 0.

SANITATION POINTS IN OUTBUILDINGS (notation: OUTBS) - Similar as for BATH.

EXTENT OF FENCING (notation: FENCE) - An index indicating the extent of the property boundary enclosure. The index is calculated in terms of cost and extent of fencing per property side. The base value is 100 for wire fencing on one side of the property. The variable value is the arithmetic sum of the values per property side.

EXTENT OF GARDEN DEVELOPMENT (notation: GARDEN) - An ordinal variable with the following categories and values: No garden development (0), weak garden development (3), good (new) garden development (6) and good (established) garden development (9). Was determined through visual inspection and was correlated with the resident to determine whether any improvements had been affected since purchase.

GROSS AREA OF SITE (notation: GLSZ) - The registered size of the site in square meters. Obtained from the Bloemfontein Deeds Office.

NETT AREA OF SITE (notation: NLSZ) - Equals GLSZ less the area of any section of the site that is subjected to any servitudes, over and above those applicable to the majority of properties, that prevent the utilisation of the total property. Examples of such servitudes are onerous building lines, stormwater servitudes, pipeline servitudes, etc.

SUBDIVISIBILITY OF THE SITE (notation: DIV) - Indicates whether the property is of sufficient extent to be subdivisible as well as the number of additional sites that can be cut from the property. If the property is not subdivisible, the variable takes a value = 0, if one additional site can be cut from the property, the variable takes a value = 1, if two additional sites can be cut from the property, it takes a value = 2, etc.

VIEW FROM THE SITE (notation: VIEW) - A dichotomous variable with the categories and values: No view (1) and an excellent view (2).

GRADIENT OF SITE (notation: GRAD) - The data were taken from topographical maps of the area. The formula used was

$$\frac{\text{vertical distance}}{\text{horizontal distance}} \times 100$$

A gradient of 45° would thus have a value = 100.

SOIL TYPE (notation: SOIL) - An ordinal variable with the categories and values: Clay or rock (1), normal soil (2) and good soil (3). Taken from Senekal (1977), pp. 58 - 64 and confirmed and extended through visual inspection.

HEIGHT ABOVE SEA LEVEL (notation: HEIGHT) - Taken from topographical maps. HEIGHT = Actual height - 1 000 m. Where the property had a marked slope, the height was taken at the position of the dwelling on the site.

LENGTH OF FRONTAGE (notation: FRONT) - In meters, taken from the Surveyor-General (O.F.S.) 1 : 2 500 cadastral maps.

DEPTH OF SITE (notation: DEPTH) - Similar as FRONT.

PERCEPTION OF SMOKE POLLUTION (notation: PERCPP) - Taken from Lazenby, pp. 140 - 146. An indication of the average perception of the residents of residential neighbourhoods of the extent of smoke pollution in the neighbourhood. Measured on the 5-point Likert scale but to do away with integer number perception scores, Lazenby recalculated the scores as an index. A value of 0,6 implies a non-significant attitude towards smoke pollution. All values < 0,6 indicate a negative attitude while values > 0,6 reflect a positive attitude (Lazenby, p. 207).

DISTANCE TO NEAREST INDUSTRIAL AREA (notation: DIND) - Linear distance in meters.

DISTANCE TO NEAREST RAILWAY LINE (notation: DRAIL) - Linear distance in meters.

DISTANCE TO NEAREST FREEWAY (notation: DFREE) - Linear distance in meters.

HOUSING AND SITE QUANTITY (notation: HSQT) - Factor scores on factor 1 of the variables measuring the housing quantity of neighbourhoods.

AGE OF HOUSING STOCK (notation: AGED) - Factor scores on factor 2 of the variables measuring the housing quantity of neighbourhoods.

LOW QUALITY HOUSING (notation: LQLH) - Factor scores on factor 1 of the variables measuring the housing quality of neighbourhoods.

HIGH QUALITY ARCHITECTURALLY DESIGNED HOUSING (notation: HQLAH) - Factor scores on factor 2 of the variables measuring the housing quality of neighbourhoods.

INCOME AND OCCUPATIONAL STATUS (notation: INOC) - Factor scores on factor 1 of the variables measuring the socio-economic status of neighbourhoods.

OCCUPATIONAL AND EDUCATIONAL LEVELS (notation: OCED) - Similar as INOC but factor scores of factor 2.

MIDDLE HIGH OCCUPATIONAL STATUS (notation: MHOC) - Similar as INOC but factor scores of factor 3.

OCCUPATIONAL PARTICIPATION OF MOTHERS (notation: OPM) - Similar as INOC but factor scores of factor 4.

OCCUPATIONAL PARTICIPATION OF MOTHERS (notation: OPM) - Similar as INOC but factor scores of factor 4.

PERCEPTION OF SAFETY (notation: PERCPS) - An indication of the feeling of residential safety experienced by residents of various neighbourhoods. Source and calculation similar as PERCPP.

NEW HOUSING DEVELOPMENT (notation: NHD) - Factor scores on factor 1 of the variables measuring the pride of ownership exhibited by residents of various neighbourhoods.

PRIDE OF OWNERSHIP (notation: PROW) - Similar as NHD but factor scores of factor 2.

MUNICIPAL TAX (notation: TMT84) - A variable measuring the total municipal tax payable as at 1 July 1984. In respect of dwellings located within the Bloemfontein municipal area, $TMT84 = (r_l . AVL_j + s_l . AVI_j) - 0{,}4 (r_l . AVL_j + s_l . AVI_j)$, where r_l (town rate) = 0,055, s_l (sanitary rate) = 0,0047, AVL_j = assessed value of land and AVI_j = assessed value of improvements. The residents of Langenhoven Park paid fixed levies which amounted to R504,00 per annum in respect of each developed piece of land, irrespective of the valuations of their properties. The R504,00 comprised a local rate of R120,00, a sanitary levy of R204,00 and a water levy of R180,00.

DISTANCE TO CBD (notation: DCBD) - Direct linear distance measured in meters.

DISTANCE TO NEAREST COMMUNITY SHOPPING CENTRE (notation: DREGC) - Direct linear distance measured in meters.

AVAILABILITY OF FUNDS (notation: REDL) - An ordinal variable that indicates the percentage of the total purchase price of housing that building societies are prepared to advance financing on. The categories and values are: No loans (0), 0 - 74 % of the purchase price (70), 75 % of the purchase price (75) and 80 % of the purchase price (80).

APPENDIX B CORRELATION MATRIX OF THE DEPENDENT AND INDEPENDENT VARIABLES USED IN MULTIPLE REGRESSION ANALYSES

	PRICE	MAREA	OAREA	PAREA	UPAREA	NROOM	OROOM	BEDR	BATH	OUTBLD	GARAG
PRICE	1.0000	.7892**	.4188**	.1844**	.1542**	.6967**	.7158**	.4762**	.6465**	.2886**	.4545**
MAREA	.7892**	1.0000	.4031**	.1622**	.1725**	.7305**	.7692**	.5058**	.6429**	.3665**	.4375**
OAREA	.4188**	.4031**	1.0000	.2632**	.1737**	.4223**	.4556**	.2945**	.2766**	.4494**	.4164**
PAREA	.1844**	.1622**	.2632**	1.0000	.0465	.1407**	.1586**	.1153**	-.0270	.3690**	.0116
UPAREA	.1542**	.1725**	.1737**	.0465	1.0000	.1847**	.1559**	.1344**	.1412**	.2403**	.1043*
NROOM	.6967**	.7305**	.4223**	.1407**	.1847**	1.0000	.8922**	.6855**	.6169**	.2652**	.4663**
OROOM	.7158**	.7692**	.4556**	.1586**	.1559**	.8922**	1.0000	.6038**	.6201**	.3125**	.4835**
BEDR	.4762**	.5058**	.2945**	.1153**	.1344**	.6855**	.6038**	1.0000	.4713**	.2060**	.3357**
BATH	.6465**	.6429**	.2766**	-.0270	.1412**	.6169**	.6201**	.4713**	1.0000	.0485	.4881**
OUTBLD	.2886**	.3665**	.4494**	.3690**	.2403**	.2652**	.3125**	.2060**	.0485	1.0000	.0750
GARAG	.4545**	.4375**	.4164**	.0116	.1043*	.4663**	.4835**	.3357**	.4881**	.0750	1.0000
CPORT	.0285	.0754	.1705**	.1114**	.0566	.0739	.0494	.0357	-.0513	.2388**	-.3427**
DATE	-.1762**	-.0314	.2173**	.4467**	.1247**	-.0752	-.0539	-.0248	-.3687**	.5476**	-.1834**
COND	.1903**	.0829*	-.1716**	-.2307**	-.1995**	.0728	.0784	-.0213	.2905**	-.4242**	.1538**
HTYPE	-.1840**	-.2057**	-.1060*	-.0542	.0185	-.2370**	-.2020**	-.1870**	-.1999**	.1353**	-.1833**
DESIGN	.2045**	.2858**	.0887*	-.0120	.0008	.2099**	.2262**	.1260**	.1341**	.1793**	.0643
DSTYLE	.6191**	.5881**	.2279**	.0937*	.0621	.5018**	.5021**	.2883**	.5353**	.1255**	.3276**
EXT	.2662**	.2433**	.0556	-.0931*	-.0016	.2181**	.2314**	.0965*	.3315**	-.1217**	.1923**
ROOF	.2941**	.2068**	.0531	-.0462	-.0068	.1547**	.1780**	.0514	.2237**	-.0134	.1129**
KCUP	.2652**	.2249**	.1526**	-.0507	.0409	.2266**	.2289**	.1273**	.2767**	-.0335	.2248**
KFIX	.3128**	.2787**	.1675**	.0162	.0615	.2526**	.2744**	.1612**	.2293**	.1392**	.1694**
KSAN	.2377**	.2349**	.0330	-.1246**	.0087	.2488**	.2801**	.1664**	.4170**	-.2104**	.2785**
BEDC	.3962**	.3554**	.1417**	-.1295**	.0228	.3876**	.3728**	.1918**	.4888**	-.1094**	.3295**
AIRCON	.2068**	.1444**	.2001**	.1165**	.0393	.1490**	.1761**	.1265**	.0859*	.2107**	.0542
BURGLR	.0712	.0900*	.2321**	.1787**	.1283**	.1355**	.1114**	.1520**	-.1108**	.3001**	.0766
HEAT	.1932**	.2492**	.2798**	.2202**	.1712**	.2000**	.2167**	.1726**	.0446	.4113**	.0781
OUTBS	.3430**	.3270**	.2534**	.2148**	.1528**	.2368**	.2380**	.1817**	.2206**	.4166**	.1815**
BORE	.1650**	.2076**	.1152**	.0989*	.0949*	.1930**	.1661**	.1431**	.0826*	.2648**	.0175
POOL	.4898**	.3815**	.2636**	.2296**	.1962**	.3522**	.3230**	.3032**	.2366**	.2635**	.1434**
DRIVE	.3461**	.2894**	.3394**	.0891*	.2072**	.3267**	.2923**	.2541**	.1759**	.3298**	.1937**
FENCE	.1339**	.1306**	.2747**	.2123**	.1983**	.1507**	.1370**	.1622**	-.0940*	.4083**	.0530
GARDEN	.2510**	.2400**	.3549**	.2340**	.2465**	.2326**	.2139**	.1907**	.0177	.4182**	.0911*
GLSZ	.5933**	.5535**	.2903**	.2002**	.1177**	.5166**	.5169**	.3264**	.4655**	.2587**	.2799**
NLSZ	.6037**	.5679**	.3154**	.2225**	.1275**	.5203**	.5235**	.3345**	.4488**	.2968**	.2833**
DIV	.2833**	.2995**	.1677**	.2328**	.0756	.2668**	.2666**	.2145**	.1905**	.3003**	.0304
VIEW	.1798**	.1774**	.0788	.0754	.0449	.0987*	.1063*	.0449	.0899*	.0602	.0351
GRAD	.2894**	.2568**	.0973*	.2011**	.0717	.2063**	.2074**	.1564**	.1805**	.0857*	.0776
SOIL	.2893**	.2460**	.1311**	.0944*	.0594	.2484**	.2703**	.1994**	.3164**	.0301	.2355**
HEIGHT	.3150**	.2297**	-.0071	-.1828**	.0077	.2413**	.2334**	.1590**	.4024**	-.2184**	.2793**
FRONT1	.2873**	.3105**	.1223**	.0632	.0152	.3323**	.3170**	.2310**	.2159**	.0850*	.1136**
DEPTH	.2862**	.2684**	.1441**	.1687**	.0116	.2078**	.2259**	.0912*	.1896**	.1217**	.0919*
PERCPP	.1782**	.0585	-.1201**	-.0869*	-.0665	.0560	.0481	.0111	.2461**	-.2694**	.0910*
DIND	.2501**	.1492**	-.0388	-.1229**	-.1176**	.1338**	.1484**	-.0037	.3259**	-.2107**	.1299**
DRAIL	.4064**	.2729**	.1078*	.0570	-.0906*	.2534**	.2429**	.1018*	.3405**	-.0570	.2073**
DFREE	-.0202	.0648	.2152**	.4313**	.1045*	-.0028	.0500	.0322	-.2747**	.4664**	-.1212**
HSGT	.7291**	.6872**	.4094**	.2320**	.1771**	.6256**	.6589**	.4185**	.5660**	.3619**	.3858**
AGED	-.1449**	-.0380	.1934**	.4222**	.1183**	-.0945*	-.0805	-.0164	-.4082**	.5335**	-.2258**
LGLH	-.4087**	-.4292**	-.1494**	.0574	.0007	-.3825**	-.4015**	-.1910**	-.5279**	.0533	-.3006**
HGLAH	.5717**	.4641**	.2770**	.3370**	.1712**	.3690**	.4127**	.2809**	.2962**	.3996**	.1472**
INOC	.5699**	.4915**	.2827**	.3357**	.2015**	.4252**	.4385**	.3481**	.3399**	.3572**	.1462**
OCED	.2061**	.2000**	.0285	-.0388	-.0735	.1778**	.1721**	.0758	.2420**	-.0024	.1247**
MHOC	.2270**	.2056**	.0419	-.1183**	-.0330	.1643**	.1613**	.0720	.2641**	-.1082*	.1064*
OPM	.2285**	.2250**	.2436**	.0783	.0616	.2311**	.2477**	.1308**	.1634**	.2464**	.1634**
PERCPB	.1305**	.1239**	.1580**	.1379**	.0596	.1338**	.1324**	.0951*	.0504	.2155**	.1136**
NHD	-.1596**	-.0638	.2278**	.2898**	.2011**	-.0613	-.0706	.0485	-.3768**	.5228**	-.1491**
PROW	.2453**	.1656**	.1011*	.0297	.1188**	.1769**	.1540**	.1911**	.1328**	.0534	.0967*
TMT84	.7821**	.7078**	.3115**	.0991*	.0861*	.6177**	.6400**	.3807**	.6494**	.1796**	.3993**
DCBD	-.0083	-.1133**	-.2932**	-.3714**	-.1499**	-.0677	-.0757	-.0980*	.2394**	-.5410**	.0489
TWORK	-.0210	-.0263	-.1255**	-.0268	-.0004	-.0444	-.0542	-.0036	-.0033	-.1120**	-.0788
DREGC	.1219**	.0283	-.0659	.0535	-.0992*	-.0232	.0060	-.0564	.0217	-.0702	-.0791
REDL	.3459**	.2687**	.0268	-.0611	-.0253	.2553**	.2329**	.1204**	.3806**	-.2084**	.2087**

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APPENDIX B   Continued...

	CPORT	DATE	COND	HTYPE	DESIGN	DSTYLE	EXT	ROOF	KCUP	KFIX	KSAN
PRICE	.0285	-.1762**	.1903**	-.1840**	.2045**	.6191**	.2662**	.2941**	.2652**	.3128**	.2377**
MAREA	.0754	-.0314	.0829*	-.2057**	.2858**	.5881**	.2433**	.2068**	.2249**	.2787**	.2349**
OAREA	.1705**	.2173**	-.1716**	-.1060*	.0887*	.2279**	.0556	.0531	.1526**	.1675**	.0330
PAREA	.1114**	.4467**	-.2307**	-.0542	-.0120	.0937*	-.0931*	-.0462	-.0507	.0162	-.1246**
UPAREA	.0566	.1247**	-.1995**	.0185	.0008	.0621	-.0016	-.0068	.0409	.0615	.0087
NROOM	.0739	-.0752	.0728	-.2370**	.2099**	.5018**	.2181**	.1547**	.2266**	.2526**	.2488**
OROOM	.0494	-.0539	.0784	-.2020**	.2262**	.5021**	.2314**	.1780**	.2289**	.2744**	.2801**
BEDR	.0357	-.0248	-.0213	-.1870**	.1260**	.2883**	.0965*	.0514	.1273**	.1612**	.1664**
BATH	-.0513	-.3687**	.2905**	-.1999**	.1341**	.5353**	.3315**	.2237**	.2767**	.2293**	.4170**
OUTBLD	.2388**	.5476**	-.4242**	.1353**	.1793**	.1255**	-.1217**	-.0134	-.0333	.1392**	-.2104**
GARAG	-.3427**	-.1834**	.1538**	-.1833**	.0643	.3276**	.1923**	.1129**	.2248**	.1694**	.2785**
CPORT	1.0000	.2647**	-.1423**	.0739	.1443**	.0177	-.0806	.0094	.0037	.0095	-.1272**
DATE	.2647**	1.0000	-.5822**	.1973**	.0586	-.2328**	-.2974**	-.1536**	-.2161**	-.0442	-.3428**
COND	-.1423**	-.5822**	1.0000	-.1966**	-.0826*	.2192**	.2820**	.1592**	.2375**	.0680	.3013**
HTYPE	.0739	.1973**	-.1966**	1.0000	-.0255	-.3155**	-.0815	-.0785	-.1421**	-.0317	-.1056*
DESIGN	.1443**	.0586	-.0826*	-.0255	1.0000	.1893**	.0137	.1260**	.0402	.1344**	.1153**
DSTYLE	.0177	-.2328**	.2192**	-.3155**	.1893**	1.0000	.2574**	.2710**	.2973**	.2003**	.2521**
EXT	-.0806	-.2974**	.2820**	-.0815	.0137	.2574**	1.0000	.1259**	.1879**	.1226**	.2815**
ROOF	.0094	-.1536**	.1592**	-.0785	.1260**	.2710**	.1259**	1.0000	.1247**	.0348	.0950*
KCUP	.0037	-.2161**	.2375**	-.1421**	.0402	.2973**	.1879**	.1247**	1.0000	.0817	.1929**
KFIX	.0095	-.0442	.0680	-.0317	.1344**	.2003**	.1226**	.0348	.0817	1.0000	.1301**
KSAN	-.1272**	-.3428**	.3013**	-.1056*	.1153**	.2521**	.2815**	.0950*	.1929**	.1301**	1.0000
BEDC	-.0066	-.4235**	.3635**	-.2632**	.0446	.4585**	.2446**	.1821**	.4537**	.0957*	.3112**
AIRCON	.0941*	.0923*	-.0842*	-.0334	.0878*	.1425**	-.0077	.0692	.0638	.0605	-.0036
BURGLR	.1216**	.3673**	-.3638**	.0693	.0323	-.0649	-.1457**	-.0972*	-.0499	.0190	-.1336**
HEAT	.2088**	.3685**	-.2925**	-.0903*	.1494**	.1675**	-.0093	-.0143	.0336	.0742	-.1080*
OUTBS	.0981*	.1121**	-.0719	-.0644	.1486**	.2163**	.1045*	.0450	.0452	.1737**	-.0173
BORE	.1726**	.2280**	-.1238**	-.0404	.0597	.1404**	-.0151	.0662	.0120	.0403	-.0349
POOL	.0833*	.0790	-.0976*	-.0616	.0813	.2542**	.0152	.1211**	.0816	.1329**	.0053
DRIVE	.0988*	.0927*	-.1636**	-.1338**	.1052*	.2347**	-.0072	.0719	.1376**	.1191**	-.0018
FENCE	.1251**	.4030**	-.4646**	.0732	.0780	-.0065	-.1478**	-.0727	-.0107	.0514	-.2115**
GARDEN	.1845**	.3317**	-.3367**	-.0860*	.0847*	.1140**	-.1103**	-.0408	.0532	.1199**	-.1624**
GLSZ	.0771	-.0293	.1157**	-.1869**	.1311**	.4852**	.1679**	.2395**	.1150**	.1872**	.1527**
NLSZ	.1034*	.0188	.0900*	-.1844**	.1434**	.4927**	.1345**	.2295**	.0989*	.2091**	.1472**
DIV	.1525**	.2196**	-.0873*	-.0298	.1589**	.2043**	-.0247	.1405**	-.0448	.0401	.0698
VIEW	-.0066	-.0219	.0090	-.0242	.1426**	.1464**	.0839*	.0772	.0256	-.0217	.0267
GRAD	.0005	.0390	.0326	-.1062*	.1253**	.2707**	.0799	.0399	.0760	.1191**	.0450
SOIL	-.0622	-.0770	.0995*	-.1537**	.0416	.3112**	.0760	.1264**	.0810	.1275**	.2245**
HEIGHT	-.1913**	-.4949**	.3424**	-.1051*	.0575	.3056**	.2213**	.0748	.1796**	.1688**	.3499**
FRONT1	.0414	-.1088*	.0909*	-.1156**	.0821	.2244**	.1029*	.1266**	.0874*	.1263**	.1265**
DEPTH	.0841*	.0433	.0692	-.0656	.0733	.2345**	.0758	.1407**	.0209	.0861*	.0089
PERCPP	-.1782**	-.4378**	.3284**	-.1699**	-.0465	.2123**	.1177**	.1191**	.1096**	.0690	.2317**
DIND	-.0807	-.4308**	.4040**	-.0980*	-.0341	.2025**	.2609**	.2481**	.2278**	.0845*	.2425**
DRAIL	-.0718	-.2534**	.3392**	-.1647**	-.0054	.3063**	.2233**	.1804**	.1648**	.1359**	.1279**
DFREE	.2045**	.7408**	-.4594**	.0510	.0679	-.0778	-.2315**	-.0573	-.1820**	.0191	-.3167**
HSQT	.0475	.0367	.0344	-.1600**	.1318**	.5763**	.1912**	.2026**	.1795**	.2466**	.1833**
AGED	.2820**	.8583**	-.5578**	.1751**	.0301	-.2170**	-.2841**	-.1140**	-.2105**	-.0306	-.4082**
LQLH	.0437	.3257**	-.3418**	.2842**	-.0605	-.5744**	-.2588**	-.1585**	-.2834**	-.1299**	-.3333**
HQLAH	.0441	.1720**	-.1039*	-.0613	.1046*	.3699**	.0430	.1863**	.0110	.2021**	-.0168
INOC	.0735	.1512**	-.0586	-.1112**	.0854*	.4202**	.1070*	.1849**	.0521	.1362**	.0524
OCED	-.0021	-.1139**	.1899**	-.0718	.0364	.2370**	.0651	.1173**	.1297**	.0765	.0279
MHOC	-.0591	-.3274**	.2874**	-.1557**	.0361	.3121**	.1381**	.0994*	.1999**	.0870*	.2169**
OPM	.1002*	.1064*	-.1523**	-.0431	.0315	.1358**	-.0536	.0161	.0878*	.1114**	.0416
PERCPS	-.0056	.1549**	-.1590**	.0070	.0361	.1508**	-.0998*	-.1244**	.0610	.1037*	-.0134
NHD	.2363**	.7000**	-.6838**	.1477**	.0499	-.2525**	-.3631**	-.1887**	-.2080**	-.0555	-.4242**
PROW	-.0870*	-.1328**	-.0617	-.1458**	.0644	.1416**	-.0681	.0163	-.0114	.1286**	.0388
TMTB4	-.0059	-.2923**	.2788**	-.2331**	.1573**	.6522**	.2819**	.3024**	.2644**	.2591**	.2820**
DCBD	-.2293**	-.7607**	.4974**	-.1463**	-.0626	.0753	.2453**	.1390**	.1570**	.0013	.3444**
TWORK	-.0030	-.1367**	.0446	-.0028	-.0498	-.0517	-.0661	.0077	-.0060	-.0106	.0177
DREOC	.0043	-.1069*	.1359**	-.0568	-.0140	.0933*	.0776	.2304**	-.0028	.0096	-.0349
REDL	-.0802	-.4569**	.3338**	-.4928**	.0590	.4664**	.1574**	.1641**	.1942**	.0779	.2169**

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APPENDIX B Continued...

	BEDC	AIRCON	BURGLR	HEAT	OUTBS	BORE	POOL	DRIVE	FENCE	GARDEN	GLSZ
PRICE	.3962**	.2068**	.0712	.1932**	.3430**	.1650**	.4898**	.3461**	.1339**	.2510**	.5933**
MAREA	.3554**	.1444**	.0900*	.2492**	.3270**	.2076**	.3815**	.2894**	.1306**	.2400**	.5535**
OAREA	.1417**	.2001**	.2321**	.2798**	.2534**	.1152**	.2636**	.3394**	.2747**	.3549**	.2903**
PAREA	-.1295**	.1165**	.1787**	.2202**	.2148**	.0989*	.2296**	.0891*	.2123**	.2340**	.2002**
UPAREA	.0228	.0393	.1283**	.1712**	.1528**	.0949*	.1962**	.2072**	.1983**	.2465**	.1177**
NROOM	.3876**	.1490**	.1355**	.2000**	.2368**	.1930**	.3522**	.3267**	.1507**	.2326**	.5166**
OROOM	.3728**	.1761**	.1114**	.2167**	.2380**	.1661**	.3230**	.2923**	.1370**	.2139**	.5169**
BEDR	.1918**	.1265**	.1520**	.1726**	.1817**	.1431**	.3032**	.2541**	.1622**	.1907**	.3264**
BATH	.4888**	.0859*	-.1108**	.0446	.2206**	.0826*	.2366**	.1759**	-.0940*	.0177	.4655**
OUTBLD	-.1094**	.2107**	.3001**	.4113**	.4166**	.2648**	.2635**	.3298**	.4083**	.4182**	.2587**
GARAG	.3295**	.0542	.0766	.0781	.1815**	.0175	.1434**	.1937**	.0530	.0911*	.2799**
CPORT	-.0066	.0941*	.1216**	.2088**	.0981*	.1726**	.0833*	.0988*	.1251**	.1845**	.0771
DATE	-.4235**	.0923*	.3673**	.3685**	.1121**	.2280**	.0790	.0927*	.4030**	.3317**	-.0293
COND	.3635**	-.0842*	-.3638**	-.2925**	-.0719	-.1238**	-.0976*	-.1636**	-.4646**	-.3367**	.1157**
HTYPE	-.2632**	-.0334	.0693	-.0903*	-.0644	-.0404	-.0616	-.1338**	.0732	-.0860*	-.1869**
DESIGN	.0446	.0878*	.0323	.1494**	.1486**	.0597	.0813	.1052*	.0780	.0847*	.1311**
DSTYLE	.4585**	.1425**	-.0649	.1675**	.2163**	.1404**	.2542**	.2347**	-.0065	.1140**	.4852**
EXT	.2446**	-.0077	-.1457**	-.0093	.1045*	-.0151	.0152	-.0072	-.1478**	-.1103**	.1679**
ROOF	.1821**	.0692	-.0972*	-.0143	.0450	.0662	.1211**	.0719	-.0727	-.0408	.2395**
KCUP	.4537**	.0638	-.0499	.0336	.0452	.0120	.0816	.1376**	-.0107	.0532	.1150**
KFIX	.0957*	.0605	.0190	.0742	.1737**	.0403	.1329**	.1191**	.0514	.1199**	.1872**
KSAN	.3112**	-.0036	-.1336**	-.1080*	-.0173	-.0349	.0053	-.0018	-.2115**	-.1624**	.1527**
BEDC	1.0000	.0136	-.0871*	-.0186	.0843*	-.0005	.0896*	.1456**	-.1011*	.0033	.2754**
AIRCON	.0136	1.0000	.0932*	.1374**	.1038*	.1426**	.1990**	.1390**	.1483**	.1531**	.1144**
BURGLR	-.0871*	.0932*	1.0000	.2745**	.1184**	.0780	.1394**	.2978**	.4377**	.4138**	.0092
HEAT	-.0186	.1374**	.2745**	1.0000	.2425**	.2086**	.1781**	.2935**	.3258**	.3670**	.1747**
OUTBS	.0843*	.1038*	.1184**	.2425**	1.0000	.0883*	.2002**	.1585**	.1648**	.2292**	.2093**
BORE	-.0005	.1426**	.0780	.2086**	.0883*	1.0000	.1194**	.1208**	.0796	.2192**	.2501**
POOL	.0896*	.1990**	.1394**	.1781**	.2002**	.1194**	1.0000	.2657**	.2599**	.2644**	.3051**
DRIVE	.1456**	.1390**	.2978**	.2935**	.1585**	.1208**	.2657**	1.0000	.4359**	.4764**	.1841**
FENCE	-.1011*	.1483**	.4377**	.3258**	.1648**	.0796	.2599**	.4359**	1.0000	.5846**	-.0652
GARDEN	.0033	.1531**	.4138**	.3670**	.2292**	.2192**	.2644**	.4764**	.5846**	1.0000	.0612
GLSZ	.2754**	.1144**	.0092	.1747**	.2093**	.2501**	.3051**	.1841**	-.0652	.0612	1.0000
NLSZ	.2585**	.1298**	.0314	.2103**	.2137**	.2570**	.3117**	.1969**	-.0407	.0852*	.9437**
DIV	-.0006	.1024*	.0594	.2078**	.1555**	.2572**	.1995**	.1013*	.0227	.0472	.5495**
VIEW	.0230	.0718	-.0070	.0757	.1592**	-.0450	.0852*	.0486	.0446	.0395	.0447
GRAD	.0890*	.0587	.0082	.0570	.1493**	-.0137	.1659**	.0878*	.0375	.0648	.2253**
SOIL	.2086**	.0889*	.0150	.0460	.1097**	.0324	.1350**	.1040*	.0233	.0486	.2169**
HEIGHT	.3357**	-.0308	-.1832**	-.1928**	.0755	-.1799**	.0604	.0443	-.1564**	-.1655**	.1373**
FRONT1	.1374**	.0001	.0081	.1119**	.0508	.0739	.1662**	.0578	-.0636	.0111	.3457**
DEPTH	.1252**	.0546	-.0111	.0049	.0891*	.1336**	.1322**	.0774	-.0338	.0061	.6466**
PERCPP	.2432**	.0069	-.2300**	-.2339**	-.0072	-.1630**	.0084	.0068	-.2022**	-.1627**	.0983*
DIND	.2750**	-.0262	-.2713**	-.1844**	-.0402	-.1131**	-.0103	-.0341	-.3678**	-.2716**	.3244**
DRAIL	.2557**	.0217	-.1633**	-.0825*	.0565	-.0053	.1767**	.0954*	-.1846**	-.1377**	.4163**
DFREE	-.3108**	.1068*	.3083**	.3303**	.1362**	.1907**	.1681**	.1644**	.4171**	.3475**	.0024
HSGT	.3064**	.1816**	.0936*	.2809**	.2834**	.2344**	.4057**	.3265**	.1690**	.2461**	.6867**
AGED	-.4182**	.0673	.3473**	.3596**	.1146**	.2116**	.1188**	.1464**	.4521**	.3803**	-.0581
LGLH	-.4663**	-.0529	.1948**	.0030	-.0546	-.0788	-.1094**	-.0156	.2563**	.0765	-.4120**
HGLAH	.0718	.1768**	.1406**	.2338**	.3513**	.1461**	.4221**	.3241**	.2847**	.2588**	.4617**
INOC	.1380**	.1841**	.0934*	.2416**	.2875**	.1993**	.4001**	.2545**	.1924**	.2230**	.5530**
OCED	.1599**	-.0159	-.0630	.0010	.0729	.0041	.1167**	.0466	-.1368**	-.0501	.1377**
MHOC	.2906**	.0529	-.2083**	-.0549	-.0599	.1008*	.0531	.0302	-.2061**	-.0483	.1933**
OPM	.1140**	.0684	.1653**	.1992**	.1308**	.0990*	.1243**	.2055**	.2294**	.1779**	.2559**
PERCPB	.0221	.0912*	.1278**	.1758**	.1762**	-.0047	.1648**	.1465**	.2519**	.1993**	.0475
NHD	-.3729**	.0866*	.4632**	.4174**	.0951*	.1853**	.1419**	.2734**	.6182**	.5266**	-.1580**
PROW	.0843*	.1181**	.1118**	.0309	.1211**	-.0392	.1733**	.2633**	.2912**	.2181**	.0768
TMT84	.4472**	.1370**	-.0884*	.1107**	.2419**	.1378**	.3656**	.2271**	-.0946*	.0261	.8276**
DCBD	.2861**	-.1121**	-.3472**	-.4054**	-.1424**	-.2686**	-.2050**	-.2054**	-.4711**	-.4076**	.0086
TWORK	.0388	-.0665	-.0443	-.0366	-.0237	-.1047*	-.0391	-.0400	-.0475	-.0627	-.0829*
DREGC	.0241	.0304	-.0686	-.1375**	.0018	-.0821	.0366	-.0173	-.1435**	-.1352**	.2447**
REDL	.3629**	.0258	-.1445**	-.0549	.0459	.0133	.1173**	.1096**	-.1937**	-.0284	.3154**

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APPENDIX B Continued...

	NLSZ	DIV	VIEW	GRAD	SOIL	HEIGHT	FRONT1	DEPTH	PERCPP	DIND	DRAIL
PRICE	.6037**	.2833**	.1798**	.2894**	.2893**	.3150**	.2873**	.2862**	.1782**	.2501**	.4064**
MAREA	.5679**	.2995**	.1774**	.2568**	.2460**	.2297**	.3105**	.2684**	.0985	.1492**	.2729**
OAREA	.3154**	.1677**	.0788	.0973*	.1311**	-.0071	.1223**	.1441**	-.1201**	-.0388	.1078*
PAREA	.2225**	.2328**	.0754	.2011**	.0944*	-.1828**	.0632	.1687**	-.0869*	-.1229**	.0570
UPAREA	.1275**	.0756	.0449	.0717	.0594	.0077	.0152	.0116	-.0665	-.1176**	-.0906*
NROOM	.5203**	.2668**	.0987*	.2063**	.2484**	.2413**	.3323**	.2078**	.0560	.1338**	.2534**
OROOM	.5235**	.2666**	.1063*	.2074**	.2703**	.2334**	.3170**	.2259**	.0481	.1484**	.2429**
BEDR	.3345**	.2145**	.0449	.1564**	.1994**	.1590**	.2310**	.0912*	.0111	-.0037	.1018*
BATH	.4488**	.1909**	.0899*	.1805**	.3164**	.4024**	.2159**	.1896**	.2461**	.3259**	.3405**
OUTBLD	.2968**	.3003**	.0602	.0857*	.0301	-.2184**	.0850*	.1217**	-.2694**	-.2107**	-.0570
GARAG	.2833**	.0304	.0351	.0776	.2355**	.2793**	.1136**	.0919*	.0910*	.1299**	.2073**
CPORT	.1034*	.1525**	-.0066	.0005	-.0622	-.1913**	.0414	.0841*	-.1782**	-.0807	-.0718
DATE	.0188	.2196**	-.0219	.0390	-.0770	-.4949**	-.1088*	.0433	-.4378**	-.4308**	-.2534**
COND	.0900*	-.0873*	.0090	.0326	.0995*	.3424**	.0909*	.0692	.3284**	.4040**	.3392**
HTYPE	-.1844**	-.0298	-.0242	-.1062*	-.1537**	-.1051*	-.1156**	-.0656	-.1699**	-.0980*	-.1647**
DESIGN	.1434**	.1589**	.1426**	.1253**	.0416	.0575	.0821	.0733	-.0465	-.0341	-.0054
DSTYLE	.4927**	.2043**	.1464**	.2707**	.3112**	.3056**	.2244**	.2345**	.2123**	.2025**	.3063**
EXT	.1345**	-.0247	.0839*	.0799	.0760	.2213**	.1029*	.0758	.1177**	.2609**	.2233**
ROOF	.2295**	.1405**	.0772	.0399	.1264**	.0748	.1256**	.1407**	.1191**	.2481**	.1804**
KCUP	.0989*	-.0448	.0256	.0760	.0810	.1796**	.0874*	.0209	.1096**	.2278**	.1648**
KFIX	.2091**	.0401	-.0217	.1191**	.1275**	.1688**	.1263**	.0861*	.0690	.0845*	.1359**
KSAN	.1472**	.0698	.0267	.0450	.2245**	.3499**	.1265**	.0089	.2317**	.2425**	.1279**
BEDC	.2585**	-.0006	.0230	.0890*	.2086**	.3357**	.1374**	.1252**	.2432**	.2750**	.2557**
AIRCON	.1298**	.1024*	.0718	.0587	.0889*	-.0308	.0001	.0546	.0069	-.0262	.0217
BURGLR	.0314	.0594	-.0070	.0082	.0150	-.1832**	.0081	-.0111	-.2300**	-.2713**	-.1633**
HEAT	.2103**	.2078**	.0757	.0570	.0460	-.1928**	.1119**	.0049	-.2339**	-.1844**	-.0825*
OUTBS	.2137**	.1555**	.1592**	.1493**	.1097**	.0755	.0508	.0891*	-.0072	-.0402	.0565
BORE	.2570**	.2572**	-.0490	-.0137	.0324	-.1799**	.0739	.1336**	-.1630**	-.1131**	-.0053
POOL	.3117**	.1995**	.0852*	.1659**	.1350**	.0604	.1662**	.1322**	.0084	-.0103	.1767**
DRIVE	.1969**	.1013*	.0486	.0878*	.1040*	.0443	.0578	.0774	.0068	-.0341	.0954*
FENCE	-.0407	.0227	.0446	.0375	.0233	-.1564**	-.0636	-.0338	-.2022**	-.3678**	-.1846**
GARDEN	.0852*	.0472	.0395	.0648	.0486	-.1655**	.0111	.0061	-.1627**	-.2716**	-.1377**
GLSZ	.9437**	.5495**	.0447	.2253**	.2169**	.1373**	.3457**	.6466**	.0983*	.3244**	.4163**
NLSZ	1.0000	.5684**	.0555	.2368**	.2217**	.1171**	.3880**	.5725**	.0708	.3031**	.4050**
DIV	.5684**	1.0000	.0001	.1543**	.1734**	-.0538	.1551**	.3332**	-.0967*	.0014	.0319
VIEW	.0555	.0001	1.0000	.4249**	-.1148**	.2264**	.0359	-.0316	.1441**	-.0575	.0636
GRAD	.2368**	.1543**	.4249**	1.0000	.2587**	.3516**	.0167	.1660**	.1801**	-.0536	.1861**
SOIL	.2217**	.1734**	-.1148**	.2587**	1.0000	.3842**	.0324	.1234**	.2476**	.0047	.0520
HEIGHT	.1171**	-.0538	.2264**	.3516**	.3842**	1.0000	.0672	.0745	.5723**	.1730**	.2599**
FRONT1	.3880**	.1551**	.0359	.0167	.0324	.0672	1.0000	-.1717**	.0174	.0952*	.0924*
DEPTH	.5725**	.3332**	-.0316	.1660**	.1234**	.0745	-.1717**	1.0000	.0684	.2321**	.3505**
PERCPP	.0708	-.0967*	.1441**	.1801**	.2476**	.5723**	.0174	.0684	1.0000	.3080**	.3492**
DIND	.3031**	.0014	-.0575	-.0536	.0047	.1730**	.0952*	.2321**	.3080**	1.0000	.6291**
DRAIL	.4050**	.0319	.0636	.1861**	.0520	.2599**	.0924*	.3505**	.3492**	.6291**	1.0000
DFREE	.0715	.1567**	.0254	.1438**	-.0860*	-.5751**	-.0653	.0522	-.4358**	-.4533**	-.1455**
HSGT	.6886**	.3243**	.0852*	.2555**	.3162**	.2139**	.2598**	.3749**	.1061*	.2565**	.4007**
AGED	-.0112	.1698**	-.0082	.0285	-.1313**	-.5499**	-.1178**	.0199	-.4259**	-.4101**	-.2502**
LGLH	-.3945**	-.0458	-.0454	-.0933*	-.2640**	-.3124**	-.2300**	-.2042**	-.2133**	-.3211**	-.2755**
HGLAH	.4893**	.3456**	.1271**	.3597**	.2570**	.0868*	.1241**	.2879**	.1390**	.0271	.2873**
INOC	.5635**	.4195**	.1811**	.3347**	.2578**	.0969*	.1358**	.3537**	.1133**	-.0018	.2806**
OCED	.1591**	-.0219	-.0236	.0963*	.1401**	.1490**	.0599	.0697	.1067*	.2712**	.3587**
MHOC	.1706**	-.0662	-.0083	-.0315	-.0553	.1457**	.1876**	.0488	.2498**	.3400**	.3126**
OPM	.2675**	.1322**	-.1753**	-.1422**	.0956*	-.1160**	.1080*	.1821**	-.1929**	.1743**	.0871*
PERCPB	.0698	.0739	.0687	.1131**	.2176**	.2174**	.0338	-.0065	.1282**	-.2645**	-.0380
NHD	-.1152**	.0837*	.0071	-.0652	-.1340**	-.4740**	-.0850*	-.1112**	-.4866**	-.5842**	-.4744**
PROW	.0861*	.0311	.0784	.2242**	.2169**	.3233**	.0323	.0534	.3278**	-.1305**	.0651
TMT84	.8096**	.3537**	.1105**	.2694**	.2903**	.3912**	.3655**	.4725**	.2810**	.4483**	.5289**
DCBD	-.0442	-.1314**	-.0265	-.0448	.1263**	.4803**	.0390	-.0017	.4963**	.5455**	.1222**
TWORK	-.0928*	-.0886*	.0257	-.0259	-.0646	.1057*	-.0003	-.0469	.1374**	.0072	-.0196
DREGC	.2456**	.0736	-.0267	.1159**	-.0433	-.2615**	.0152	.2537**	.1302**	.4105**	.2575**
REDL	.2976**	.0726	.0524	.1427**	.2929**	.4199**	.1635**	.1730**	.4933**	.3191**	.3365**

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APPENDIX B Continued...

	DFREE	HSGT	AGED	LGLH	HGLAH	INOC	OCED	MHOC	OPM	PERCPS	NHD
PRICE	-.0202	.7291**	-.1449**	-.4087**	.5717**	.5699**	.2061**	.2270**	.2285**	.1305**	-.1596**
MAREA	.0648	.6872**	-.0380	-.4292**	.4641**	.4915**	.2000**	.2056**	.2250**	.1239**	-.0638
OAREA	.2152**	.4094**	.1934**	-.1494**	.2770**	.2827**	.0285	.0419	.2436**	.1580**	.2278**
PAREA	.4313**	.2320**	.4222**	.0574	.3370**	.3357**	-.0388	-.1183**	.0783	.1379**	.2898**
UPAREA	.1045*	.1771**	.1183**	.0007	.1712**	.2015**	-.0735	-.0330	.0616	.0596	.2011**
NROOM	-.0028	.6256**	-.0945*	-.3825**	.3690**	.4252**	.1778**	.1643**	.2311**	.1338**	-.0613
OROOM	.0500	.6589**	-.0805	-.4015**	.4127**	.4385**	.1721**	.1613**	.2477**	.1324**	-.0706
BEDR	.0322	.4185**	-.0164	-.1910**	.2809**	.3481**	.0758	.0720	.1308**	.0951*	.0485
BATH	-.2747**	.5660**	-.4082**	-.5279**	.2962**	.3399**	.2420**	.2641**	.1634**	.0504	-.3768**
OUTBLD	.4664**	.3619**	.5335**	.0533	.3996**	.3572**	-.0024	-.1082*	.2464**	.2155**	.5228**
GARAG	-.1212**	.3858**	-.2258**	-.3006**	.1472**	.1462**	.1247**	.1064*	.1634**	.1136**	-.1491**
CPORT	.2045**	.0475	.2820**	.0437	.0441	.0735	-.0021	-.0591	.1002*	-.0056	.2363**
DATE	.7408**	.0367	.8583**	.3257**	.1720**	.1512**	-.1139**	-.3274**	.1064*	.1549**	.7000**
COND	-.4594**	.0344	-.5578**	-.3418**	-.1039*	-.0586	.1899**	.2874**	-.1523**	-.1590**	-.6838**
HTYPE	.0510	-.1600**	.1751**	.2842**	-.0613	-.1112**	-.0718	-.1557**	-.0431	.0070	.1477**
DESIGN	.0679	.1318**	.0301	-.0605	.1046*	.0854*	.0364	.0361	.0315	.0361	.0499
DSTYLE	-.0778	.5763**	-.2170**	-.5744**	.3699**	.4202**	.2370**	.3121**	.1358**	.1508**	-.2525**
EXT	-.2315**	.1912**	-.2841**	-.2588**	.0430	.1070*	.0651	.1381**	-.0536	-.0998*	-.3631**
ROOF	-.0573	.2026**	-.1140**	-.1585**	.1863**	.1849**	.1173**	.0994*	.0161	-.1244**	-.1887**
KCUP	-.1820**	.1795**	-.2105**	-.2834**	.0110	.0521	.1297**	.1999**	.0878*	.0610	-.2080**
KFIX	.0191	.2466**	-.0306	-.1299**	.2021**	.1362**	.0765	.0870*	.1114**	.1037*	-.0555
KSAN	-.3167**	.1833**	-.4082**	-.3333**	-.0168	.0524	.0279	.2169**	.0416	-.0134	-.4242**
BEDC	-.3108**	.3064**	-.4182**	-.4663**	.0718	.1380**	.1599**	.2906**	.1140**	.0221	-.3729**
AIRCON	.1068*	.1816**	.0673	-.0529	.1768**	.1841**	-.0159	.0529	.0684	.0912*	.0866*
BURGLR	.3083**	.0936*	.3473**	.1948**	.1406**	.0934*	-.0630	-.2083**	.1653**	.1278**	.4632**
HEAT	.3303**	.2809**	.3596**	.0030	.2338**	.2416**	.0010	-.0549	.1992**	.1758**	.4174**
OUTBS	.1362**	.2834**	.1146**	-.0546	.3513**	.2875**	.0729	-.0599	.1308**	.1762**	.0951*
BORE	.1907**	.2344**	.2116**	-.0788	.1461**	.1993**	.0041	.1008*	.0990*	-.0047	.1853**
POOL	.1681**	.4057**	.1188**	-.1094**	.4221**	.4001**	.1157**	.0531	.1243**	.1648**	.1419**
DRIVE	.1644**	.3265**	.1464**	-.0156	.3241**	.2545**	.0466	.0302	.2055**	.1465**	.2734**
FENCE	.4171**	.1690**	.4521**	.2563**	.2847**	.1924**	-.1368**	-.2061**	.2294**	.2519**	.6182**
GARDEN	.3475**	.2461**	.3803**	.0765	.2588**	.2230**	-.0501	-.0483	.1779**	.1993**	.5266**
GLSZ	.0024	.6867**	-.0581	-.4120**	.4617**	.5530**	.1377**	.1933**	.2559**	.0475	-.1580**
NLSZ	.0715	.6886**	-.0112	-.3945**	.4893**	.5635**	.1591**	.1706**	.2675**	.0698	-.1152**
DIV	.1567**	.3243**	.1698**	-.0458	.3456**	.4195**	-.0219	-.0662	.1322**	.0739	.0837*
VIEW	.0254	.0852*	-.0082	-.0454	.1271**	.1811**	-.0236	-.0083	-.1753**	.0687	.0071
GRAD	.1438**	.2555**	.0285	-.0933*	.3597**	.3347**	.0963*	-.0315	-.1422**	.1131**	-.0652
SOIL	-.0860*	.3162**	-.1313**	-.2640**	.2570**	.2578**	.1401**	-.0553	.0956*	.2176**	-.1340**
HEIGHT	-.5751**	.2139**	-.5499**	-.3124**	.0868*	.0969*	.1490**	.1457**	-.1160**	.2174**	-.4740**
FRONT1	-.0653	.2578**	-.1178**	-.2300**	.1241**	.1358**	.0599	.1876**	.1080*	.0338	-.0850*
DEPTH	.0522	.3749**	.0199	-.2042**	.2879**	.3537**	.0697	.0488	.1821**	-.0065	-.1112**
PERCPP	-.4358**	.1061*	-.4259**	-.2133**	.1390**	.1133**	.1067*	.2498**	-.1929**	.1282**	-.4866**
DIND	-.4533**	.2565**	-.4101**	-.3211**	.0271	-.0018	.2712**	.3400**	.1743**	-.2645**	-.5842**
DRAIL	-.1455**	.4007**	-.2502**	-.2755**	.2873**	.2806**	.3587**	.3126**	.0871*	-.0380	-.4744**
DFREE	1.0000	.1163**	.7729**	.2863**	.4029**	.2806**	-.1037*	-.3116**	.0922*	.0842*	.6144**
HSGT	.1163**	1.0000	.0000	-.5802**	.6550**	.7126**	.2438**	.2556**	.3757**	.1483**	-.0476
AGED	.7729**	.0000	1.0000	.4727**	.2581**	.2321**	-.1502**	-.3673**	.0716	.1130**	.7929**
LGLH	.2863**	-.5802**	.4727**	1.0000	.0000	-.2144**	-.2920**	-.5011**	-.1783**	-.0052	.4708**
HGLAH	.4029**	.6550**	.2581**	.0000	1.0000	.7800**	.1426**	-.0515	.1251**	.2318**	.1280**
INOC	.2806**	.7126**	.2321**	-.2144**	.7800**	1.0000	.0000	.0000	-.0000	.1739**	.1085*
OCED	-.1037*	.2438**	-.1502**	-.2920**	.1426**	.0000	1.0000	-.0000	.0000	.0221	-.2347**
MHOC	-.3116**	.2556**	-.3673**	-.5011**	-.0515	.0000	-.0000	1.0000	.0000	-.0828*	-.4298**
OPM	.0922*	.3757**	.0716	-.1783**	.1251**	-.0000	.0000	.0000	1.0000	.1254**	.1574**
PERCPS	.0842*	.1483**	.1130**	-.0052	.2318**	.1739**	.0221	-.0828*	.1254**	1.0000	.2299**
NHD	.6144**	-.0476	.7929**	.4708**	.1280**	.1085*	-.2347**	-.4298**	.1574**	.2299**	1.0000
PROW	.0322	.2040**	-.0704	.0839*	.4219**	.2627**	-.2477**	.1753**	.1893**	.2518**	.0000
TMTB4	-.1696**	.7856**	-.2943**	-.5636**	.5475**	.5732**	.1882**	.3597**	.2490**	.0774	-.3551**
DCBD	-.8009**	-.1456**	-.7471**	-.2765**	-.2636**	-.2866**	.1029*	.2157**	-.0917*	-.2031**	-.6960**
TWORK	-.1070*	-.1059*	-.1144**	.0489	-.0168	-.0500	-.0189	-.0073	-.0610	-.0463	-.0574
DREGC	.1736**	.1213**	.0044	-.0268	.3211**	.1760**	-.0075	-.0228	.0586	-.3336**	-.2430**
REDL	-.4340**	.2908**	-.4565**	-.4532**	.1079*	.1455**	.2302**	.3703**	.0241	.0707	-.4139**

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APPENDIX B Continued...

	PROW	TMTB4	DCBD	TWORK	DREGC	REDL
PRICE	.2453**	.7821**	-.0083	-.0210	.1219**	.3459**
MAREA	.1656**	.7078**	-.1133**	-.0263	.0283	.2687**
OAREA	.1011*	.3115**	-.2932**	-.1255**	-.0659	.0268
PAREA	.0297	.0991*	-.3714**	-.0268	.0535	-.0611
UPAREA	.1188**	.0861*	-.1499**	-.0004	-.0992*	-.0253
NROOM	.1769**	.6177**	-.0677	-.0444	-.0232	.2553**
OROOM	.1540**	.6400**	-.0757	-.0542	.0060	.2329**
BEDR	.1911**	.3807**	-.0980*	-.0036	-.0564	.1204**
BATH	.1328**	.6494**	.2394**	-.0033	.0217	.3806**
OUTBLD	.0534	.1796**	-.5410**	-.1120**	-.0702	-.2084**
GARAG	.0967*	.3993**	.0489	-.0788	-.0791	.2087**
CPORT	-.0870*	-.0055	-.2293**	-.0030	.0043	-.0802
DATE	-.1328**	-.2923**	-.7607**	-.1367**	-.1069*	-.4569**
COND	-.0617	.2788**	.4974**	.0446	.1359**	.3338**
HTYPE	-.1458**	-.2331**	-.1463**	-.0028	-.0568	-.4928**
DESIGN	.0644	.1573**	-.0626	-.0498	-.0140	.0590
DSTYLE	.1416**	.6522**	.0753	-.0517	.0933*	.4664**
EXT	-.0681	.2819**	.2453**	-.0661	.0776	.1574**
ROOF	.0163	.3024**	.1390**	.0077	.2304**	.1641**
KCUP	-.0114	.2644**	.1570**	-.0060	-.0028	.1942**
KFIX	.1286**	.2591**	.0013	-.0106	.0096	.0779
KSAN	.0388	.2820**	.3444**	.0177	-.0349	.2169**
BEDC	.0843*	.4472**	.2861**	.0388	.0241	.3629**
AIRCON	.1181**	.1370**	-.1121**	-.0665	.0304	.0258
BURGLR	.1118**	-.0884*	-.3472**	-.0443	-.0686	-.1445**
HEAT	.0309	.1107**	-.4054**	-.0366	-.1375**	-.0549
OUTBS	.1211**	.2419**	-.1424**	-.0237	.0018	.0459
BORE	-.0392	.1378**	-.2686**	-.1047*	-.0821	.0133
POOL	.1733**	.3656**	-.2050**	-.0391	.0366	.1173**
DRIVE	.2633**	.2271**	-.2054**	-.0400	-.0173	.1096**
FENCE	.2912**	-.0946*	-.4711**	-.0475	-.1435**	-.1937**
GARDEN	.2181**	.0261	-.4076**	-.0627	-.1352**	-.0284
GLSZ	.0768	.8276**	.0086	-.0829*	.2447**	.3154**
NLSZ	.0861*	.8076**	-.0442	-.0928*	.2456**	.2976**
DIV	.0311	.3537**	-.1314**	-.0886*	.0736	.0726
VIEW	.0784	.1105**	-.0265	.0257	-.0267	.0524
GRAD	.2242**	.2694**	-.0448	-.0259	.1159**	.1427**
SOIL	.2169**	.2903**	.1263**	-.0646	-.0433	.2929**
HEIGHT	.3233**	.3912**	.4803**	.1057*	-.2615**	.4199**
FRONT1	.0323	.3655**	.0390	-.0003	.0152	.1635**
DEPTH	.0534	.4725**	-.0017	-.0469	.2537**	.1730**
PERCPP	.3278**	.2810**	.4963**	.1374**	.1302**	.4933**
DIND	-.1305**	.4483**	.5455**	.0072	.4105**	.3191**
DRAIL	.0651	.5289**	.1222**	-.0196	.2575**	.3365**
DFREE	.0322	-.1696**	-.8009**	-.1070*	.1736**	-.4340**
HSGT	.2040**	.7856**	-.1456**	-.1059*	.1213**	.2908**
AGED	-.0704	-.2943**	-.7471**	-.1144**	.0044	-.4565**
LGLH	.0839*	-.5636**	-.2765**	.0489	-.0268	-.4532**
HGLAH	.4219**	.5479**	-.2636**	-.0168	.3211**	.1079*
INOC	.2627**	.5732**	-.2866**	-.0500	.1760**	.1455**
OCED	-.2477**	.1882**	.1029*	-.0189	-.0075	.2302**
MHOC	.1753**	.3597**	.2157**	-.0073	-.0228	.3703**
OPM	.1893**	.2490**	-.0917*	-.0610	.0586	.0241
PERCPS	.2518**	.0774	-.2031**	-.0463	-.3336**	.0707
NHD	.0000	-.3551**	-.6960**	-.0574	-.2430**	-.4139**
PROW	1.0000	.2009**	.0354	.1077*	.0820	.2086**
TMTB4	.2009**	1.0000	.1595**	-.0349	.2281**	.4724**
DCBD	.0354	.1595**	1.0000	.1472**	.2232**	.4232**
TWORK	.1077*	-.0349	.1472**	1.0000	.0369	.0271
DREGC	.0820	.2281**	.2232**	.0369	1.0000	.0615
REDL	.2086**	.4724**	.4232**	.0271	.0615	1.0000

* - SIGNIF. LE .01 ** - SIGNIF. LE .001

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APPENDIX C HEDONIC PRICE EQUATION FOR THE UNSTRATIFIED HOUSING PRICE MODEL SELECTED THROUGH STEPWISE REGRESSION

Variable	Estimated coefficient	Standard error of estimated coefficient	Standardised estimated coefficient	t-value
MAREA	168,68674	17,01404	,28907	9,915
TMTB4	34,22664	6,78986	,20779	5,041
DSTYLE	2910,22755	924,74870	,07430	3,147
POOL	8601,02557	1279,41372	,12178	6,723
OUTBS	46,04642	22,30178	,03575	2,065
COND	2046,99550	443,77670	,09576	4,613
DAREA	59,67213	23,78316	,04996	2,509
AIRCON	3496,80740	1880,79263	,02996	1,859
BURGLR	1398,28097	929,61904	,02734	1,504
GARDEN	619,68108	132,89817	,09150	4,663
DRAIL	,86119	,38315	,04413	2,248
DROOM	771,93494	488,81815	,06056	1,579
ROOF	52,72969	14,02242	,06179	3,760
FRONT	-48,32866	26,27027	-,03500	-1,840
PAREA	116,47769	37,37818	,05841	3,116
KFIX	25,48597	9,36590	,04462	2,721
DEPTH	-154,97548	59,62384	-,05431	-2,599
INOC	1659,01154	803,96822	,06597	2,069
NROOM	1270,49850	742,43896	,06154	1,711
LQLH	2305,39507	812,77503	,09167	2,836
GARAG	10,96885	6,93097	,03119	1,583
OPM	837,44205	494,85949	,03330	1,692
DATE	-15,57625	5,13875	-,10495	-3,031
HTYPE	10195,72126	2966,48505	,05850	3,437
HQLAH	1022,28036	829,52549	,04065	1,232
HSQT	1827,50428	1164,40886	,07267	1,569
AGED	-1502,06780	928,42545	-,05973	-1,618
VIEW	4482,91236	2569,54660	,02852	1,745
CONSTANT	-26035,53906	6642,17588		-3,920

APPENDIX D HEDONIC PRICE EQUATION AND RELATED STATISTICS FOR THE UNSTRATIFIED HOUSING PRICE MODEL WITH OUTLIERS DELETED

Variable	Estimated coefficient	Standard error of estimated coefficient	Standardised estimated coefficient	t-value
MAREA	133,27733	14,05108	,24794	9,485
TMT84	46,47122	6,55336	,30694	7,091
DSTYLE	2661,50724	709,26330	,07591	3,752
POOL	7848,14663	1002,77684	,12154	7,826
OUTBS	56,22264	17,63239	,04765	3,189
COND	2247,90308	355,03409	,11879	6,332
OAREA	61,50946	18,80336	,05762	3,271
BURGLR	1884,75752	744,66603	,04154	2,531
GARDEN	470,24592	113,25049	,07831	4,152
DRAIL	,91366	,30669	,05282	2,979
OROOM	672,99953	387,23519	,05878	1,738
KFIX	31,22013	7,39230	,06147	4,223
NROOM	1150,61586	587,70844	,06210	1,958
LQLH	2143,15666	496,76614	,09674	4,314
GARAG	10,44031	5,49711	,03341	1,899
DATE	-17,60051	3,03709	-,13304	-5,795
HTYPE	7125,14368	2138,93541	,04643	3,073
HSQT	3394,99267	702,99215	,14824	4,829
VIEW	6575,73217	2002,64304	,04639	3,284
GLSZ	-7,50301	1,86667	-,12398	-4,019
FENCE	3,59075	1,42948	,05012	2,512
BORE	4152,21880	1350,40155	,04665	3,075
BATH	17,00792	8,70886	,04356	1,953
DIV	3530,12063	1759,03801	,03509	2,007
DREEC	,61628	,29325	,03160	2,102
CONSTANT	-22852,29666	5125,01781		-4,459

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SUMMARY

The ultimate purpose of this study is the construction of a prognostic model of the value of single-family housing. This model can be applied by valuers to determine unbiased, mass valuations of single-family housing for property tax purposes. The property tax, which is the most important independent source of income available to local authorities in South Africa, has continuously been attacked by laymen and academics alike. The primary motivation for these attacks has been the apparent inequitability and inefficiency of the property tax.

By improving the administration of the property tax through upgrading and improvement of the valuation procedure, the efficiency of the property tax is enhanced while the equitability of the valuations is ensured. This in turn maximises the financial-resource-generating possibilities of the property tax and makes the tax politically and economically more acceptable. The present erosion of political and economic autonomy experienced by local governments owing to the increased dependence on the undershoring of their financial base through financial assistance extended by central government, would to a large extent also be reversed.

Improvement of the valuation procedure through the application of the housing price model developed in this study results in spatially neutral valuations being obtained with vertical and horizontal valuation equity resulting. The relative varying contribution of each property within a certain price and land use category to the income of local authorities would now not be the

result of the valuation process but the result of a political decision by the locally elected representatives who would, through the determination of the randage or differential randage, determine this relative tax contribution.

Through the combined application of factor analysis, cluster analysis and multiple regression analysis, the model of the price of housing that has been constructed, produces market value valuations that show a high degree of correspondence with observed market prices. The predictive ability of the model has been further improved by basing the theoretical foundation of the model on the ecological paradigm. The identification, within the larger overall White single dwelling residential submarket of Bloemfontein and Langenhoven Park, of spatially specific submarkets of integrated economic and socio-geographic status into which the owner-occupiers of single-family housing differentiate and the subsequent construction of separate prediction equations for each submarket, lead to the determination of superior estimates of the market value of housing.

Contrary to the conclusion arrived at by Schnare and Struyk in Boston and Ball and Kirwin in Bristol, the greater Bloemfontein property market operates as a series of submarkets. Primary property submarkets (based on the restriction of the property interest activities and segregation of the property activity space of various racial groups) and secondary property submarkets (based on the segregation and restriction of the property interests and property activity space of the agents of supply and allocation and consumers of properties of different land usages) have been distinguished in the greater Bloemfontein area.

Within the White single dwelling residential submarket, owner-occupiers, of dwellings, of a similar social status, cluster in spatially specific subareas. This is the result of the propensity of households to live close to other households of a similar social status. These spatially specific subareas effectively form submarkets at a third level of disaggregation.

The weak cross-price elasticities between submarkets result in independent hedonic price equations of the attributes of housing developing for each submarket. The strength of the coefficients differs for the submarkets because of the importance of different sets of attributes accounting for housing prices in particular submarkets. The importance of specific attributes in the hedonic price equations thus seems to be a function of the peculiar composition of the submarket and of the variability in each submarket of the attributes of housing.

THE PROPERTY VALUES OF SINGLE-FAMILY HOUSING: A CASE STUDY OF BLOEMFONTEIN

PART 2

BY

A.G. ENSLIN

JULY 1987

INDEX OF FIGURES

FIGURE 1 SAMPLING: CLUSTER ANALYSIS ZONES

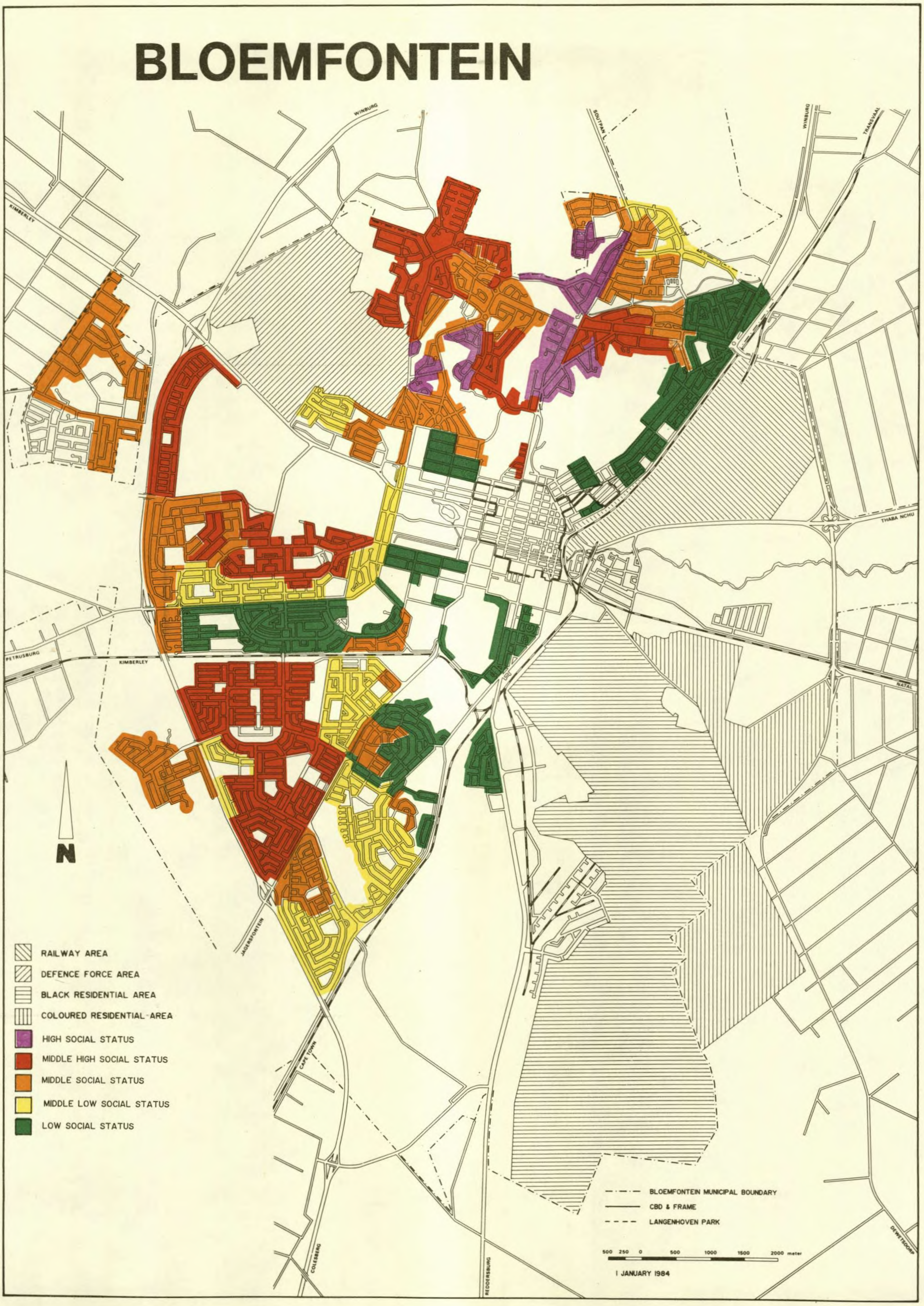

FIGURE 2 HOMOGENEOUS GEOGRAPHIC AREAS

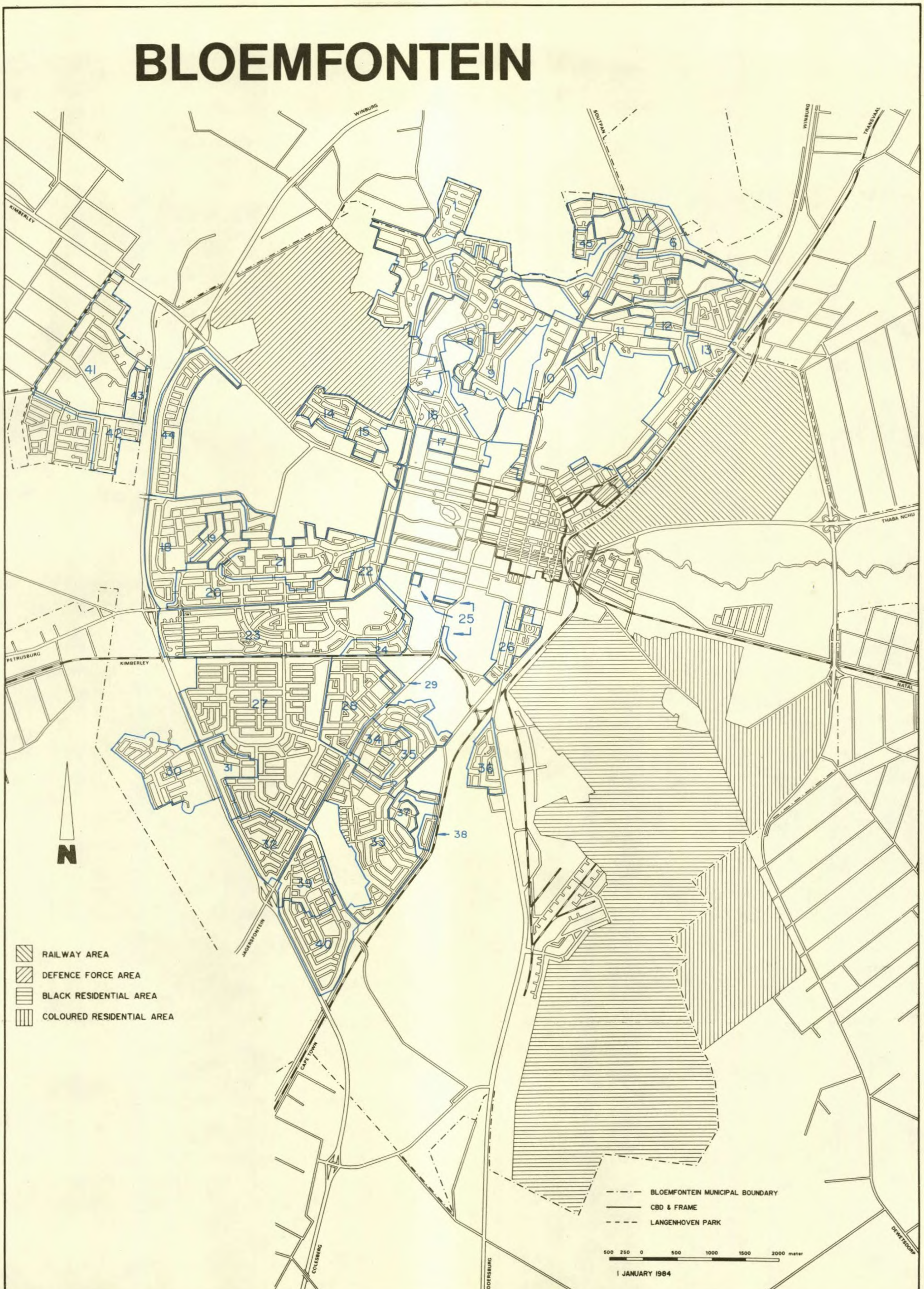

FIGURE 3 SAMPLING ZONES

FIGURE 4 WHITE SINGLE DWELLING RESIDENTIAL SUBMARKET

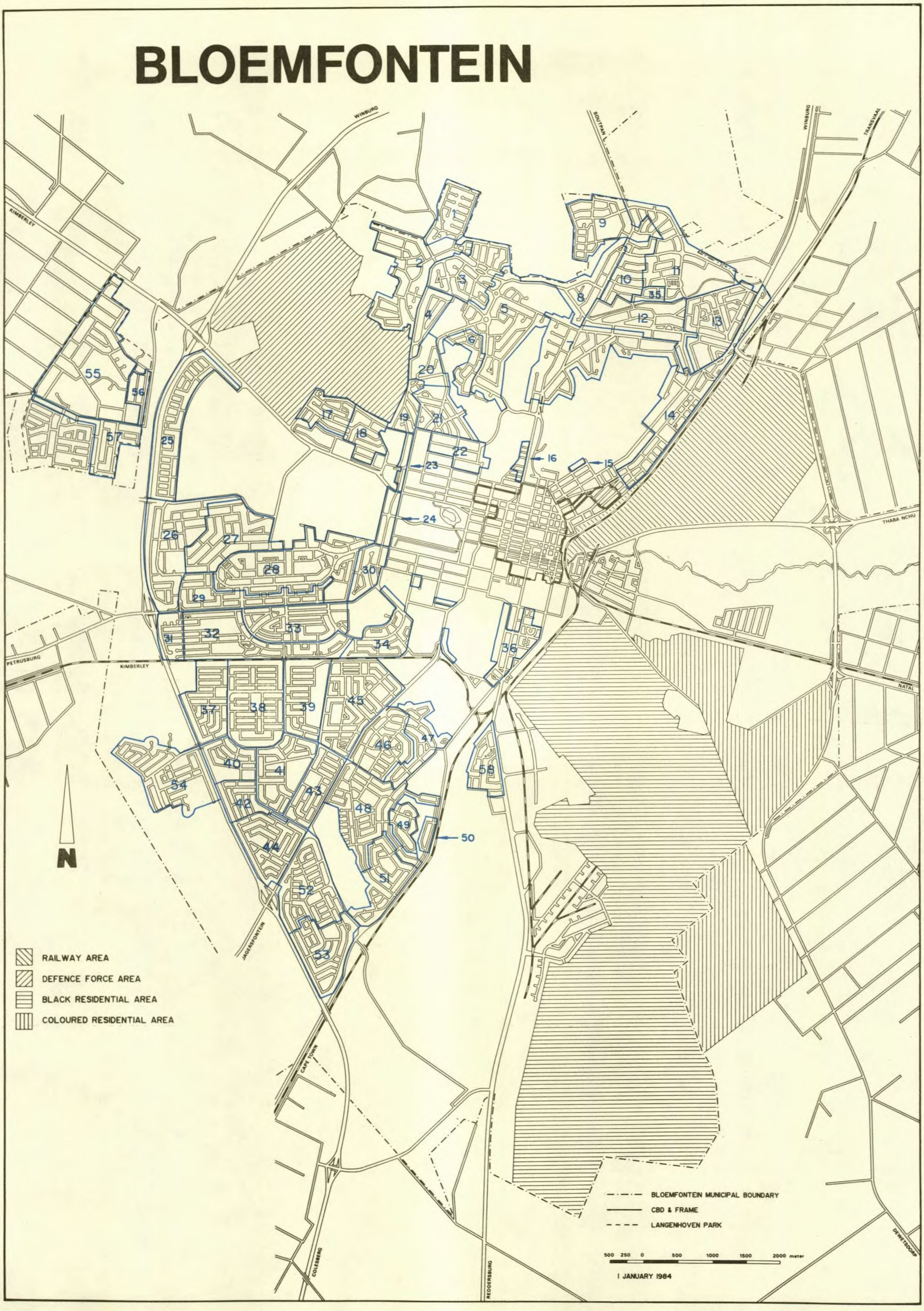

FIGURE 5 INITIAL SPATIAL CLUSTERS OF THE OWNER-OCCUPANTS OF HOUSING

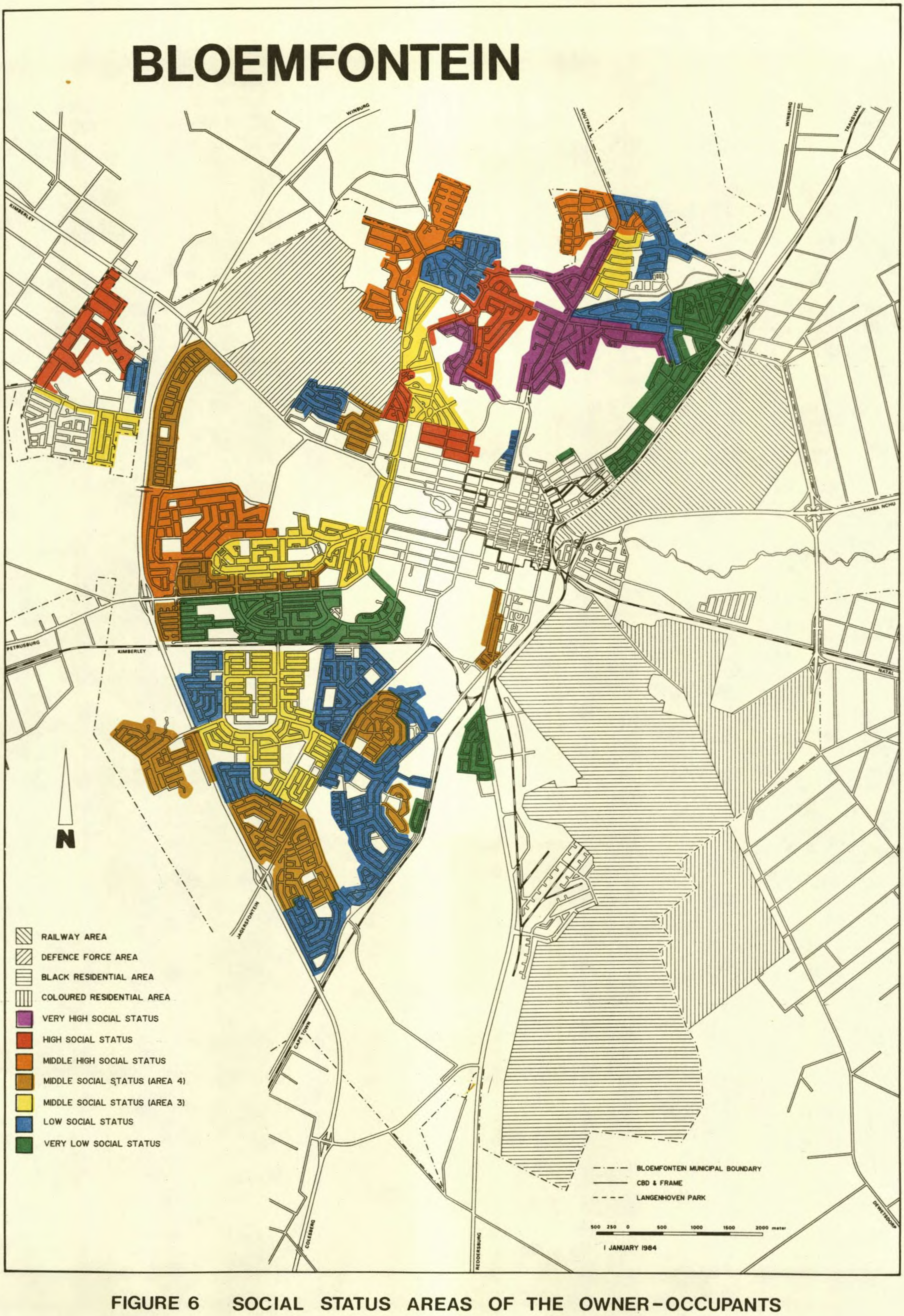

FIGURE 6 SOCIAL STATUS AREAS OF THE OWNER-OCCUPANTS OF HOUSING

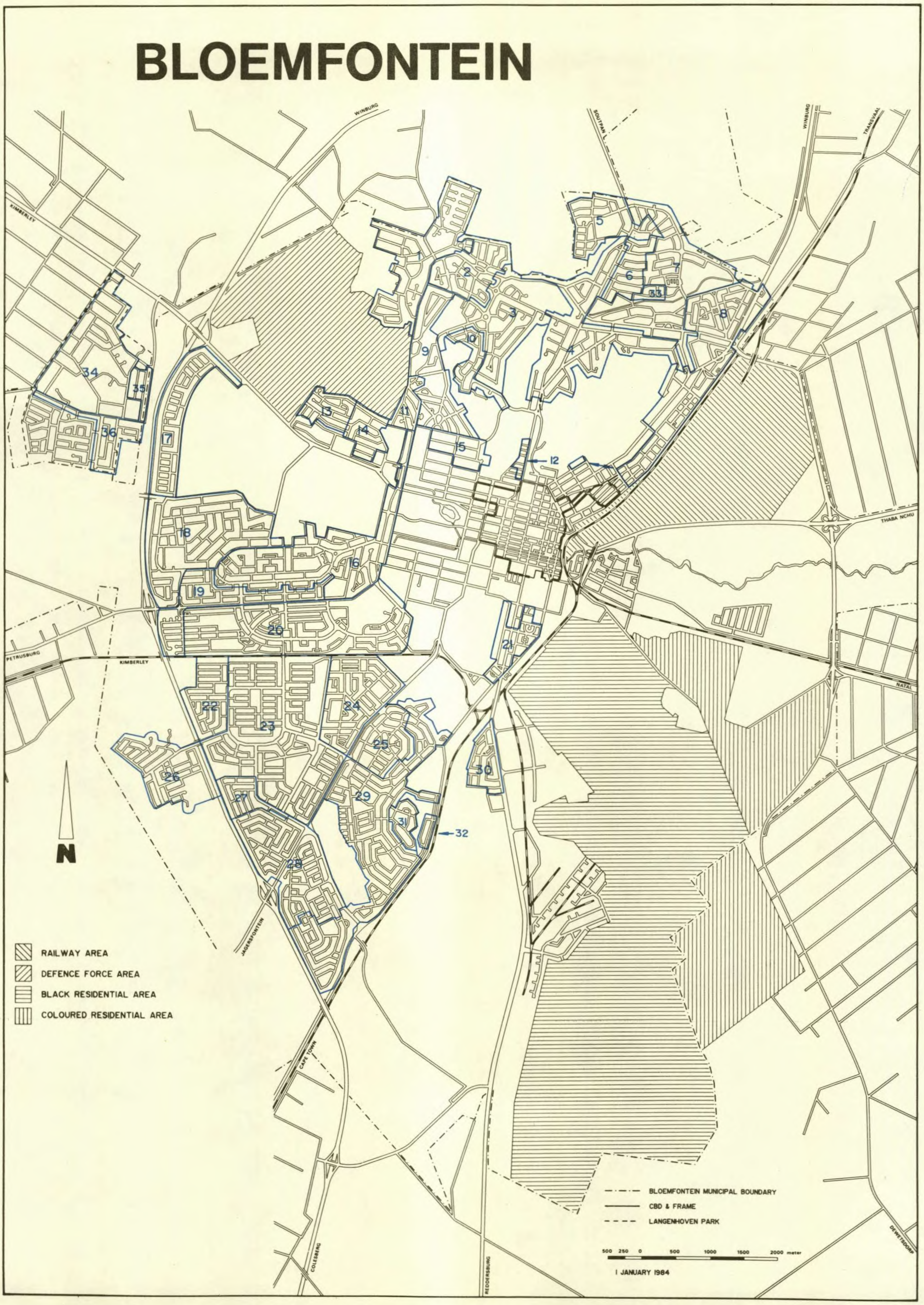

FIGURE 7 HOMOGENEOUS NEIGHBOURHOODS OF THE OWNER-OCCUPANTS OF HOUSING